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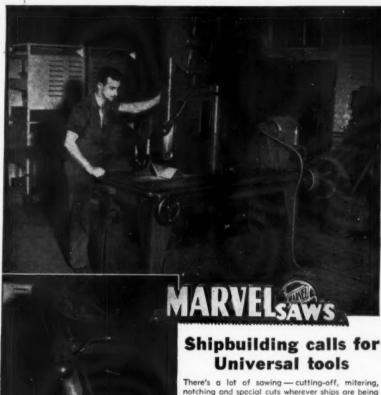
HEAT TREATMENT

FLOW

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Method



notching and special cuts wherever ships are being built, and work comes in all sizes, too. That's why you'll find MARVEL No. 8 Metal Cutting Band Saws in shipyards and Navy yards, as well as in tool rooms and die shops.

The MARVEL No. 8 is the most universal sawing machine built. It will snip off 1/8" drill rod or cut off an 18" x 18" structural shape with equal efficiency, or will save hours of machining by roughing work to size and shape. It will cut at any angle from 45° right to 45° left, has a large "T" slotted table (for holding irregular shapes, special fixtures, etc.) and both power and hand feeds. It is a busy machine wherever found, for it does so many different jobs and does each one well.

Mitering a structural angle from-with a MARVEL No. 8. The blade is fed into the work. Work is held stationary on the bed in quick action vise.





1. You get finest adjustments.

Hobart's Multi-Range Dual Control gives you 1,000 combinations of voltage and current assuring best results under all conditions.

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Inherent reactance due to special design. Gives exceptional arc stability at all settings.

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HOBART BROTHERS COMPANY Box TB-14 TROY, OHIO

"One of the World's Largest Builders of Electric Arc Welders"

Use HOBART

Specifically designed for production work — you will find a size and

HOBART "Simplified"

NEVER TOO to

There is an army of unskilled operators ready to cut perfect threads with the Rivett Thread Tool. Not new, but proven, this tool helped win the last war and is again ready to throw its weight into Victory Production.

The Rivett Thread Tool is an attachment for any screw cutting engine lathe, and takes the place of single point thread tools commonly used. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth progressively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. The thread tool does the rest.

Descriptive bulletin and ordering instructions

are available on request.



After Cut No. 1





After Cut No.



After Cut No. 10

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LATHE & GRINDER BRIGHTON-BOSTON-MASS

for all makes of Lathes and Milling Machines HARDINGE Precision Collets

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To Increase Output

... see that every lathe, planer and shaper is equipped with the correct ARMSTRONG TOOL HOLDERS. With the correct ARMSTRONG TOOL HOLDERS you can greatly increase speeds and feeds, can safely do most standard machining operations efficiently at speeds often double those accepted as "standard", can double output per man, per machine tool and per hour.

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Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5
Published Monthly Volume 40, No. 2

FEBRUARY 1944

Featured in This Issue	123
Editor's Page	125
An Electronic Primer By C. T. Pearce	127
Presses for Post-War Work	147
Tooling for Flying Fortresses By Frank V. Faulhaber	161
Foremanship Forum (Part XVII) Wage & Salary Stabilization By Edmund Mottershead	173
Aspects of Modern Milling	
Trends on the Production Front	213
Your Tax Problems	223
1943 Arc Welding Developments	233
Incorporate Cutting Tool Manufacturers' Association	a236
"Let's Talk Shop"	241
What's New in Metal Working	274
Mechanics Through the Ages	398
Index to Advertisers	404-410



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How to Do
Jobs Like These
on your
Horizontal
Boring Mill



G. & L.
Continuous Feed Facing
and Boring Head Increases
Flexibility... Reduces Settings

SORING AND FACING of large one-piece valve bodies. Additional operations include counterboring and back facing. Flange faces are as large as 16½" dia. Facing and boring can be performed simultaneously.

Here are but three of many different jobs being simplified through the use of the G. & L. Continuous Feed Facing and Boring Head. Many additional operations and combinations of operations can be performed with equal simplicity. Perhaps much of your work can be simplified with this attachment. Write for additional data today.



THREADING one end of a large connecting god. Operations consist of rough, semi and finish boring, counterboring and threading a 12" dila, bore.







BORING FORGING DIES in assembly. Both halves are machined simultaneously with a saving of 200 hours over the previous method.

GIDDINGS & LEWIS



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- Tool Slide . . . has six separate power feeds ranging from .009" to .118" per revolution of head.
- Feed Selector. Control is provided for selection of any one of six feeds.
- 3 Directional Control . . . lever points in direction of tool slide feed.
- Micrometer Adjustment : : a graduated to .001" for tool slide adjustment.
- 5 Two Tool Holders with 3/4" tool bits furnished as standard equipment,

WRITE FOR ADDITIONAL DATA—A complete description of this attachment is contained in this booklet. When requesting your copy please indicate your business connection and the type and size of machine used. Ask for Bulletin No. BB24.

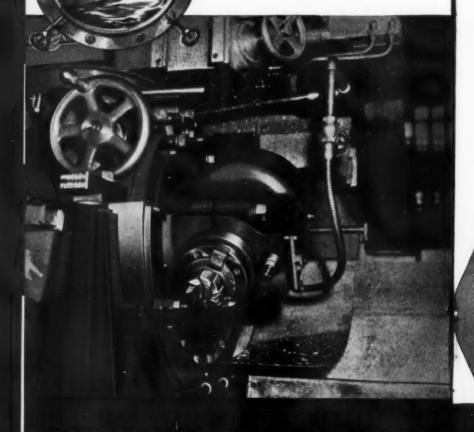


MACHINE TOOL COMPANY

FOND DU LAC, WIS.

from the Ship Yards o





ON MACHINING SLOTS INSIDE HALF-ROUND BEARINGS

The slots in bearing struts always presented one of the most difficult machining jobs in shipyards. Two or three years ago when production was of little consequence, there was no urge to change, but with the requirements for more and more ships, something had to be done about speeding up this operation. A CINCINNATI engineered Universal Index Milling Attachment, on a CINCINNATI 28" Series Vertical Hydro-Tel Miller, solved the problem. The machine has the capacity and power for milling these large parts, and the attachment is designed so that it may be indexed to several milling positions within a radius of 180 degrees. This method of machining the slots is much faster than the previous method . . the work requires only one setting and the attachment may be quickly indexed from one cut to the next.

The attachment is a typical CINCINNATI Service Engineering development for more rapid production through the use of the right machine, fixture, and cutters. Talk over your milling jobs with this group of authorities; they may find a more profitable and productive method for handling your milling operations.



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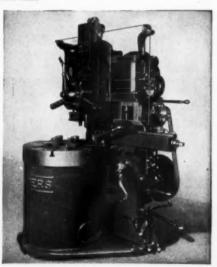
If you have, turn, drill, and thread ferrous and non-terrous castings and forgings up to 36", write for fully illustrated catalog on Standard and High-Speed Rogers "Perfect 36" Vertical Turret Mills and PRICES.

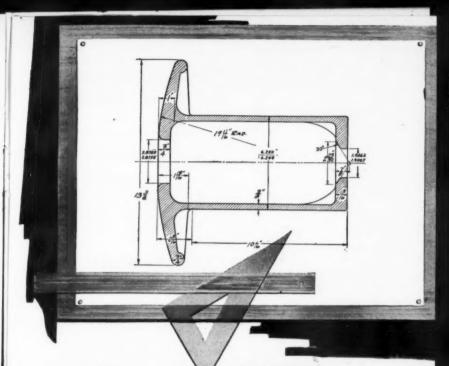
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so far, so good-BUT...

Perfection on the drawing board won't determine the working life of a rotating part. Nor will superb machining...even to the closest limits of accuracy. There's still another factor to reckon with—vibration—the arch-enemy of high speed rotation. And it won't show up until the part is finished.

True static and dynamic balance are a part of design—the part that assures long life and quiet operation in a fine product. With the aid of Gisholt Dynetric Balancing Machines you can locate, measure, and correct unbalanced forces more quickly and accurately than ever before. Ask for literature on Dynetric Balancing.

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BALANCING MACHINES



MODEL 325 FOR LARGE PARTS



MODEL 140 FOR SMALL PARTS



MODEL 350 LATHE ATTACHMENT

Streamline The Surfaces Superfinish

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LAMBERT SUPERFINISHERS are built in three sizes. The Model 325 has a swing over the bed of $14^{\prime\prime}$ and $11^{\prime\prime}$ over the carriage with $48^{\prime\prime}$ or $62^{\prime\prime}$ between centers. It is a completely universal machine for external and internal rounds, tapers, and flats.

LAMBERT MODEL 340 SUPERFINISHER

The Model 340 is a production machine for small parts. Any lathe tool, milling cutter, reamer, or any other tool that can be ground on a tool and cutter grinder, can be SUPER-FINISHED on this machine.

NOW YOUR LATHE -A SUPERFINISHER

A lathe attachment, complete with variable speed, a complete lubricant system including tank, pump and filtration system is now available. Either internal or external SUPER-FINISHING heads can be furnished.

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MACHINE COMPANY

OPTICAL COMPARATORS Verment U.S.A. MACHINE TOOLS



NOW—DALZEN BRINGS ELECTRONICS TO THREAD GRIND-ING, PROVIDING NEW EFFICIENCY, EASE OF OPERATION, SET-UP, AND COMPLETE CONTROL OF WORK QUALITY

The new Dalzen No. 5 Thread Grinder, with General Electric Thy-mo-trol drive, provides the highest possible production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Accuracy and finish are exceptional.

Grinding speed—both wheel and work—

forward and reverseis adjusted by the twist of a dial. Variation is infinite and stepless. The Thy-mo-trol drive which makes this possible is backed by General Electric's own service guarantee.

Full details on this new Dalren, which makes complete precision thread grinding available to everyone, are given in a striking three-color folder, titled "Dalren Electronic Thread Grinder." A copy will be sent you, free of charge, on request.

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Harvis HIGH SPEED TAPPERS

Jarvis Tapping Attachments are built for high speed production, and long dependable service.

Famous for long tap life and extreme accuracy.

Send for Catalog MFTI



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Protect your cutters—keep them sharp and use them correctly—it means full production from your machines as well as savings in precious High Speed Steel

The things you can do to help make your cutters wear longer and produce faster are few and comparatively simple but when practiced faithfully they extend cutter life and result in more production per cutter.

First:—use the correct cutter for the job . . . at the <u>proper</u> feed and <u>right</u> spindle speed—and operators, should remember that small cutters require higher spindle speeds than large cutters.

Then:—keep your cutters sharp. The use of a dull cutter, even for a short period, causes unnecessary wear and loss of metal when the cutter is sharpened. Sharpening should be done carefully. An improper, grinding wheel or forcing of the sharpening can burn or seriously damage à cutter. Also, the cutter's clearance should be maintained correctly.

In mounting the cutter be sure that all parts are clean — that the shank of the arbor, the taper hole and arbor collars are all clean and free from chips. Then mount the cutter, with a key to prevent slipping, as close as practicable to the spindle.

Lastly:-clamp the work securely.

War production demands the efficient use of equipment and preservation of scarce materials. Getting the most out of your milling cutters is a part of the support we should give our fighting men.

Reproductions of this advertisement for use on your bulletin boards furnished upon request.

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nside this Cover is a "Can't Be Done"



It is not a claim but a plain, unvarnished truth that Apex heavy-duty aircraft universal joints combine:

Highest strength (axial and torsional) weight ratio obtained to date;

Greatest resistance to fatigue and vibration;

Longest service life;

Permanently sealed-in lubrication;

Fully meet AAF "Winterization" directives.

The cover, an exclusive Apex development, makes the lubricant integral with the joint and lengthens its life by reducing wear and vibration, the two worst enemies of joints in service.

Now used in crucial controls of both

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Five sizes are available with torque ratings up to 10,000 inch pounds. Your request for any desired data will receive prompt attention.

THE APEX MACHINE & TOOL CO.
DAYTON, OHIO

Exclusive Licensee Under F. & S. Joint Patents



Aircraft Universal Joints

Change to Broacking REDUCES SCRAP 97%



Befere our Defense Program began, rifling in gun barrels was done by the same single point cutter method that was used in the last war. The cutter made several passes at a very low speed. Errors in indexing and lead could not be avoided. Scrap loss averaged about 6%.

Obviously, such a method could not supply our expanded Armed Forces and so a method of broaching the rifling wish a spiral spline broach was developed. The occuracy and speed obtained by broaching not only provided our Armed Forces with plenty of the best rifles in the world but scrap loss was cut to the very low figure of 0.2%. Many hundreds of broaches for rifling gun barrels up to 37mm. have been manufactured by Detroit Broach Company.

Broaching today offers many advantages to manufacturers throughout the metal-working industries. The engineering staff of Detroit Broach Company is at your service to help you increase production... improve quality... lower casts. Call or write now.

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GET THIS EXTRA SERVICE FROM DIAMONDS WHEN DRESSING GRINDING WHEELS!



WHEN you use diamond-impregnated Carboloy Dressers you get extra service from every carat of diamond. Special matrix holds even extremely small particles securely. Makes possible the use of small stones—thus taking advantage of greater proportionate area of harder, tougher, outer-skin per carat. Each diamond keeps dressing right down to the last particle of usefulness—giving you as much as 90% utilization of diamond content. No need to switch to small jobs as the dresser wears. If required, you can use same dresser, throughout its life, on same size of wheel.

Carboloy Dressers give you these advantages plus elimination of all remountings—uniform, dependable resulta—and at least a 25% annual saving in diamond dresser costs. For rough, semi-finish, and finish dressings. Available in three sizes at \$9.60, \$12.60 and \$15.35, including desired standard holder. Write for folder DR-100.

Quarter section of the Carbolav Dresser shown above. Fits all standard holders. No remountstandard holders. No remountcutting surface, simply give dresser § Usur in holder. Long periods of continuous service. 2 minutus to "recondition" when required at infrequent interests.

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USE FOR
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CARBOLOY CARBIDE DIAMOND DRESSERS

GENERAL USE ON GRINDING WHEELS



PIERCING THRU

TO VICTORY are the Armed Forces of ourselves and our Allies. MID-WEST HYDRO-PIERCE UNITS are aiding both in bringing VICTORY closer by saving considerable TIME and MANPOWER in piercing parts for many types of land, sea and air weapons. Since long before PEARL HARBOR, MID-WEST HYDRO-PIERCE UNITS have been STANDARD for the simultaneous piercing of holes in any direction in intricate shaped stampings that are not easily accessible by ordinary press practice.



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Spring Tester . .

FAST, ACCURATE INEXPENSIVE



Immediate Delivery

Using any occurate terms where the measuring element, this insuperative pring leater measures the recoil of opinings up to 7" (from langth) and 2½." In dismeter when compressed to any predictamined length. As easy to eperate is a light erbor years and as easy to each as a light erbor years and as easy to read as a school ruler—no multiple falls, so relative readings, no compile acted competitions. Just pull down the forces wanch handle, and take the direct reading when the built-in tone during the state of the state of

Wissly used for teating springs in laboratories and in heat Profine, impertion, assembly and repeat departments to distincts costly guesswork in building and auditaining automative and sixtest motors. (Note: Termin Weench NOT INCLUDED, unter manifest it

With for Bulletin ST 1

PA STURTEVANT CO.

This New RFC CATALOG

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A GUIDE TO FASTER, CLEANER, EASIER WORK The ROTARY

PIONEERS IN HAND-CUT ROTARY FILES FOR INDUSTRY

STRATFORD

CONNECTICUE

Accuracy TO WITHIN LIMITS OF .0001' in checking for runout



Greater Simplicity and Speed of Operation with this

Sundstrand Bench Center

Precision checking of work between centers can be done easier, faster, and within limits of 0.0001" on the new, improved Sundstrand Bench Center.

"One-hand control" over all movable elements leaves the operator's second hand free to control the part being checked. Both headstock and tailstock can be unclamped, positioned and locked in place with a single hand operating the top lever.

The tailstock center is quickly clamped or unclamped by means of the front lever, while the end bar retracts the springloaded center. In addition, the indicator support can be manipulated with one hand while moving it away from the work for loading and unloading, and against the work for checking the runout.

Center holes of headstock and tailstock are bored together for precision. The heavy ribbed base prevents deflection under clamping and assures a longer lifetime of accurate work. Easy to clean, compact, portable...can be placed on bench or on a stand convenient to the work.



AVAILABLE IN 6 SIZES FROM 6"x 18" TO 12"x 72"

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Simple in design—that's the main reason for the strength, precision and unvarying performance of Namco Circular Chaser Dieheads.

Adjustment for all four cutting tools is quick and positive—through only two screws—and adjustment "stays put".

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Here are the most efficient threading and hollow milling tools made—for a wide variety of work on all standard automatics. Catalog D-42 gives details,

THE NATIONAL AGNIE

ACME GRIDLEY 4-5 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS - SINGLE SPINDLE AUTOMATICS - AUTOMATIC THREADING DIES
AND TAPS - THE CHRONOLOG - LIMIT AND CONTROL STATION SWITCHES - SOLENDIS - CENTRICES - CONTROL THREADING DIES



Automatic Production of

INTRICATE

Metal Parts from Coil Stock with the U.S. Multi Slide

If your production program involves the fabrication of intricate metal parts calling for pietring, blanking, forming, swaging, and embossing operations, the U. S. Multi-Slide Machine should be of particular interest to yes.

These mathines are made in a number of sizes to accommodate steek of various widths, thicknesses, and feed lengths. Each standard Multi-Slide is equipped with four slides, one stripper, and one die head which are cam operated from the shaft system. The die head accommodates a die set in which may be mounted piercing, trimming and preliminary forming tools. The slides accommodate the final forming tools.

Many Jobs can be handled on the machines with standard equipment. The nature of certain parts, however, necessitates auxiliary equipment such as: Toggle Press or Lever Press on the larger machines (for heavy duty swaging and embossing operations), cut-off slide for use when it is advisable not to cut the part away from the strip until the final forming operations, additional die heads, wire straightener in place of flat stock straightener, auxiliary slides, etc. Illustrated below is the No. 33 U. S. Multi-Slides Machine equipped with two Die Heads, Drawings at the left litustrate interesting applications. Complete specifications for the U. S. Multi-Slides with be found in Bulletin H15. Ask for your copy.



Types of Parts handled to advantage on the U. S. Multi Slide

Metallie Belt Links for holding machine gun bullets, Automobile Accessories, Parts for Office Machines, Radio and Radio Tube Parts, Electrical Appliances, Hardware Specialties, Safety Razers, Book Bindings, Electrical Contactors, Kitchen Utensils, Bearings, Automatic Poncils.

U. S. TOOL COMPANY, INC., AMPERE (E. ORANGE), N. J.

Builders of U. S. Multi-Millers, U. S. Automatic Press Room Equipment, U. S. Die Sets & Accessories

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Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.

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Improved to meet modern needs. cient and dependable-sturdy and durable.



Compact, powerful money-saving production unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger

machines.



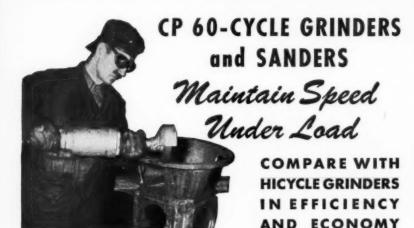
LARGE PRESS BRAKE-

The only press brake which turns out perfect work without shims and crowned dies. Patented non-deflecting bed egualizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

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THE PIECE OF PAPER

that broke a bottlenech Core the II completed propeller Lil.

"Work plan - 1776-D1" was the appropriate nomenclature for the machine and broaches which today are making production figures unbelieveable a few short months ago. They are the chief bottleneck breakers in putting out spline propeller hubs for a new type aircraft propeller. Made of especially hard steel,

> these new propellers could be turned out in mass production with the precision tolerances desired only by broaching. Exact production figures are a secret but hub splining is no longer the bottleneck.



Here is the answer to your high speed sanding problems... an expanding rubber drum that cannot bulge in the center at high surface speeds. It presents a *flat surface* to the work—at speeds as high as 9,500 surface feet per minute.

It was developed by Pratt & Whitney Engineers to meet demands by the aircraft engine and propeller industries, yet has proved itself valuable in a thousand and one

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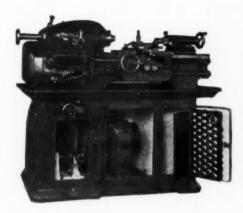
Whatever your sanding problem may be, the P&W Engineers have probably run

into similar problems in serving a wide variety of industries.

Take advantage of our experience. Write us your problem —
and send for details of this sanding drum that stays FLAT.

PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DIVISION
WEST HARTFORD, CONN.





HENDEY

TOOL AND GAGE MAKERS' LATHE

This is a high speed sensitive precision lathe, made to meet the demands for a lathe heavier and of greater adaptability than the standard bench lathe. It has a working range of spindle speeds of 40 to 2000 RPM., and it is important to note that ANY AND ALL SPINDLE SPEEDS ARE OBTAINABLE in this range.

The quick change gear box gives 66 changes of threads and a like number of feeds for either belt or gear drive. On the index plate the 66 threads range from 2 to 120 per inch without duplication. Both the thread and feed ranges are incorporated in the quick change gear feature without any gear change required.



PRINCIPAL DIMENSIONS

REGULAR EQUIPMENT

Large slotted face plate Driving Plats Micrometer carriage step Center rest High speed centers Thread chasing dial Variable speed power unit Chip pan Necessary wrenches



THE HENDEY MACHINE CO.

TORRINGTON, CONN.

PLAN-O-MILLING



FAST, ACCURATE MILLING OF CYLINDRICAL FORMS

You get the speed and high production of special purpose equipment when you replace wasteful, obsolete machines with Plan-O-Mill.

Yet Plan-O-MILL is flexible. A slight tooling change adapts it to a wide variety of thread milling and form milling jobs.

Plan-O-Mill saves manpower too! It is semi-automatic, can be operated by semi-skilled or unskilled labor. One man or woman can operate two or more Plan-O-Mills.

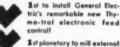
Find out about Plan-O-Mill today! Contact your machinery supplier or write direct.

AN-O-MILL

CORPORATION

1st to provide absolute con- 1511 East Eight Mile Road - Hazel Park, Michigan

WITH PLAN-O-MILL



threads with multiple thread Putter !

1st planetary to coordinate feeds and speeds!

trol of feed-in!

MELIN Ling Stile 3-FLUTE END MILLS

MOST IMPORTANT END MILL DEVELOPMENT IN 20 YEARS!

"COMBINES in a SINGLE TOOL ALL the ADVAN-TAGES of 2 and 4 FLUTE MILLS... with NONE of the DISADVANTAGES of EITHER!"

"NOW POSSIBLE to HOG and FINISH with same type of tool!"

"COMBINES FAST STOCK REMOVING
QUALITIES of 2-FLUTE MILL with SMOOTH
FINISHING QUALITIES of 4-FLUTE MILL!"

YOU, TOO, can profit from these 3-FLUTE advantages: Permits roughing and keyway milling to be done within closer limits and with a smoother finish... provides perfect balance and thus does away with flutter and chatter at high speeds... gives closer control in cutting... guarantees extra sturdiness.

WRITE TODAY FOR COMPLETE DETAILS AND NEW CATALOG



MELIN MILLS

2228 Believue Ave., Detroit 7, Mich.

- Without obligation, please send me
- ☐ Complete details on MELIN 3-FLUTE END MILLS.
- □ New Catalog No. 6 and literature.

NAME_____TITLE

COMPANY_

STATE

The Men In The Shop Can Tell You How VALUABLE The MAGNA-SINE Can Be

Robbins Engineering Co (ct. 13, 1943

Dear SixWill you Kindly furnish me with

Will you Kindly furnish me with

exp (6) Expired of John Pregnan Sixe?

No where for me at the shop.

We work for me at the shop was not we have they are in how what we sixed they are the short them.

I the time. I don't know what we don't the form what we have they are his not have them.

I the time. I we did not have them.

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I the time of we did not have them.

This letter was written by a man working in the Special Tool Department of one of the best known of the New England machine tool manufacturers. Like hundreds of other shop men, he knows first hand that the Magna-Sine makes possible faster, more accurate angular set-ups.

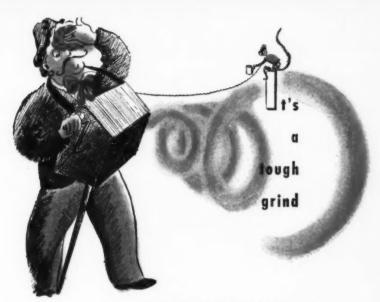
Check with any machine operator who has used the Magna-Sine or any inspector who has used the Robbins Sine Plate (built on the same principles but non-magnetic) and you'll realize how they speed up the production of any angular grinding work. Then let us send you complete information.



ROBBINS ENGINEERING COMPANY

318 MIDLAND AVENUE

DETROIT 3. MICHIGAN



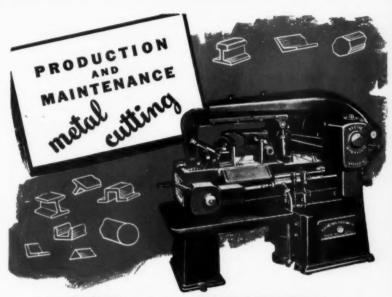
Sure, Tony, it's a tough grind. but it's a tougher grind for all the men responsible for grinding-wheel performance.

Those men will tell you why they prefer Abrasive RED BAND diamond dressing tools. In addition to three generations of diamond experience, Abrasive alone offers the engineering triumph, the "Oxide-Free Process" which fuses diamonds and powdered metal so miraculously that even the final fraction of each stone wears out in useful service. providing better work, more ork per set-up. Write for catalog and details.

THE CROWN SEWELS OF INDUST

KRW offers VERSATILITY and ADAPTABILITY in HYDRAULIC ARBOR PRESSES





with RACINE hydraulic HEAVY DUTY METAL saws

The Racine Heavy Duty Production Saw has a progressive combination "Positive" and "Flexible" hydraulic feed. The "Positive" feed predetermines cutting time. Each cut, even though it be made in tough alloys or tool steels, is made in exactly the same length of time.

The "Flexible" feed permits blade to cut faster when resistance is reduced. Faster cutting is attained in round bars, tubing, through the thin section of structurals and other shapes, by the use of this feed. This progressive combination "Positive" and "Flexible" feed is exclusive with Racine.

Racine's complete saw line includes a wide range of machines. Models are available to meet the varied requirements of all metal working industries. Capacities from 6" x 6" to 20" x 20",

Write for complete catalog and time study of your work. Address Department MT-S.

RACINE OIL HYDRAULIC PUMPS AND VALVES

Racine "Variable Volume" Oil Hydraulic Pumps and "Balanced Piston" Valves provide special advantages for hydraulic circuits in a wide variety of applications. Pump capacities of 12-20 and 30 G.P.M. Operating pressures 50 to 1000 lbs. Valves in all sizes to 1½". Write for Catalog P-10-C.



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Standard for Quality
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The ROTAB simplifies machining or checking.

The face plate can be rotated to any degree and adjusted to any angle from the vertical to the horizontal position and to 30° below the horizontal the opposite way.

Dials showing both degree and minute graduations register the rotary and angular settings.

Adjustable degree ring under face plate to avoid excessive turning of the handwheel to obtain the zero setting.

Sturdy bearings to hold faceplate in position. Ample clamping facilities.

A sine bar is furnished to provide greater accuracy on angular settings.

Also Manufacturers of Precision Surface Plates - Angle Plates - Parallels, etc. - RESCRAPING to proved master plates,

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THE GRAND KAPIUS NO. 6

UNIVERSAL CUTTER AND TOOL GRINDER

THIS NO. 6 GRINDER FEATURES

All Times
Convenient Location of All Controls
All Wheel Shafts Mounted on Grease-Sealed Ball Bearings
Provision for Built-in Dust Callector

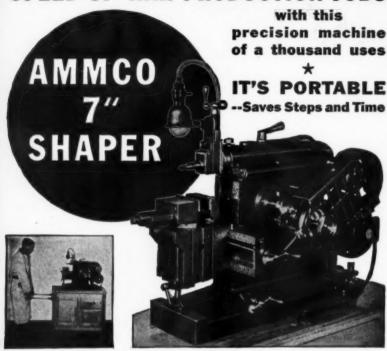
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GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W.

(4) GRAND RAPIDS, MICH.

SPEED-UP WAR PRODUCTION JOBS



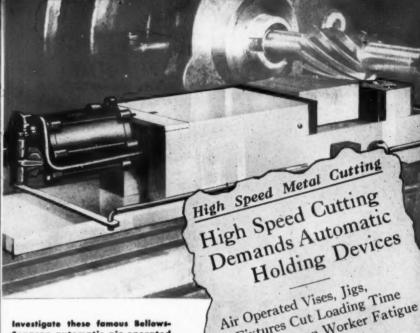
Just wheel up to bench - - plug in - - go to work!

On jobs requiring a stroke of 7° or less, the AMMCO 7° PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet, as shown above at left, available as optional equipment, enables this shaper to be moved about the shop. It can be rolled from one job to another, and can be brought right up to machine or bench where man is working...Write today for specifications and prices.



AUTOMOTIVE MAINTENANCE MACHINERY CO. 2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.



Senacon automatic air-operated holding devices for speeding production by machine tools:

The CVH-60 Milling Machine Vise clamping pressures as high as 40,000 pounds

The CV-40 Air Vise - a ready made jig for holding small parts

The BF-60 and 90 Drill Press Feeds for advancing cutting tools automatically

The Bellows-Senacon Air Motors - to operate custom-made jigs and fixtures

Write for new Free Bulletins today!

Fixtures Cut Loading Time and Lessen Worker Fatigue

AKRON, O. — Automatic opening and closing vises, jigs and fixtures, synchronized with the movement of the machine, are proving as important as the new high speed metal cutting tools in America's almost fantastic production records. These new devices, operated by airnew usymes, operated by arrepower, frequently cut machine loading time in half, actually add from four to six hours extra cutting time to an eight hour machine shift.

The Bellows Co.

STABLISHED 1911

EAST TALLMADGE AVENUE, AKRON, OHIO



GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

America's war plants are switching to new, powerful Speedy Air Vises! From a single vise ... to an installation of fifty ... they are saving time, effort and labor costs! Air operated, foot controlled-both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. \$6 Complete with Foot Control Valve, Air Hose and Fittings, only

DELIVERY 7-10 DAYS! ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT



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TRIPLE THREAT PRODUCTION STAR

- 1 No belts to shift. Drives to large step of cone at all speeds.
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● It's helping to bring schedules through on time in hundreds of plants. Ir.creases production capacity 25% to 300%. Saves time. Slashes costs. For lathes, shapers, milling machines, turret lathes, radial drills, boring mills, hobbing machines, Browne & Sharpe and Cleveland Automatic Screw Machines and other tools. See your dealer...or write for details.

Outstanding Performance for These Users:

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Designed for the removal and separating of the air from fine dust, arising from grinding, buffing and polishing wheels, sand belts, scratch wheels and abrasive cutting wheels, or any other dust producing apparatus.

Made in three sizes to fit your individual machines. Economical in operation. Conserves heated air in cold weather. All units designed for air speed necessary to convey various material. A 3" static suction at 5000 ft. velocity.

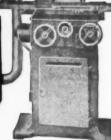
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- * A two in one High Efficiency Dust Collector
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A MANUFACTURER ASKED US THIS QUESTION:

"Can an ELMES HYDRAULIC PRESS do my Metal Forming Work <u>Better?"</u>



ELMES HYDRAULIC PRESS

Rugged, strictly precision and highly accurate unit, entirely self-contained. ELMES Engineers studied his problem . . . an Elmes Hydraulic Press was installed . . . with these startling results:

The Elmes hydraulic press, with a speed control of the pressure stroke, did in one operation the job that previously required two presses. Thus it saved one pressman's time and released one press for duty elsewhere. The Elmes press practically eliminated spoiled material and rejects. And it made possible the use of less costly, but equally as serviceable, grade of steel. In the light of this manufacturer's experience, why don't you ask Elmes Engineers to help you select efficient hydraulic equipment?

Features that guarantee outstanding Press Performance

- HIGH SPEED. Rapid transverse to work and from work, with automatic slow down and speed control for working part of stroke. Permits, in some instances, use of a cheaper grade of drawing steel. Also reduces spoilage.
- VARIETY OF CONTROLS. Manual, semi-automatic, automatic.
- 3. FULL PRESSURE CAPACITY THROUGHOUT ENTIRE STROKE.
- 4. EXCEPTIONALLY ACCURATE GUIDING OF MOVING PLATENS.
- 5. DAMAGE DUE TO OVERLOAD DEFINITELY ELIMINATED.
- 6. STROKE CONTROL MINIMIZES IDLE STROKE.
- 7. DEFINITE TIME SAVING IN DIE SETUP.
- 8. COLUMN STOPS WILL TAKE FULL LOAD OFF PRESS.

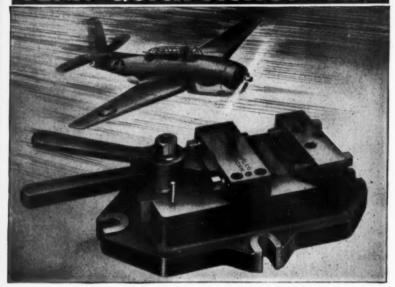
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METAL-WORKING PRESSES - PLASTIC-MOLDING PRESSES - EXTRUSION PRESSES - PUMPS - ACCUMULATORS - VALVES - ACCESSONIES

FENN QUICK-ACTION VISE



The War Time Tool that Will Speed Up Peace Time Production

It took a war time emergency to show war production plants the many advantages of the Fenn Quick Action Vise for small parts handling. Wherever there's a milling, drilling, tapping or assembling operation, there's a waiting job for a Fenn Vise, such as small parts for airplanes, machinery, automobile, precision instruments and tools. All working parts made of hardened ground steel. Precision fitted jaws, perfectly aligned. Three sizes: 4", 5", 7". Send for Bulletin No. 15 today.

THE FENN MANUFACTURING CO. HARTFORD, CONNECTICUT

Improve Precision with Sau-Way MASTER SETTING AND CHECKING ROLLS For Accurate Tool Checking

Your precision tools and inspection devices are only as accurate as the methods and gages by which they are set and checked. In many cases, flat gage blocks are not adequate. This Sav-Way Set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, snap gages, amplifiers, and dial indicators. You'll be surprised at the low cost.

Set consists of twenty rolls ranging from .100" to 2.000" in diameter. Hardened, ground, and lapped to X gage tolerance. Housed in modern transparent plastic case.

Send Coupon for Circular



Sav-Way Industries, Box 117, Harper Station, Detroit 13, Michigan, U. S. A. Please send circular describing Sav-Way Master Setting and Checking Rolls.

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THE J. C. GLENZER COMPANY, INC.

6465 EPWORTH BLVD.

DETROIT, MICH



He surveyed the job and recommended the right tools for it—Rotor High Cycle Electric right-angle sanders. They hit it up at a load speed of 4000 R.P.M. Results:

- Because of higher speed under load, three Rotors now do the work of the six universals.
- 2. Man-hours were cut 50%.
- 3. Rotor Sanders weigh 4 lbs. less; are easier to handle.
- 4. Tool maintenance is less.

Perhaps your sanding and grinding time and costs could be given a similar launching to a sub level. We're at your service . . . gratis of course. Yours for the right tool.

HIGH CYCLE O'TOOL

ROTOR TOOL

High Cycle Electric Sanders 4000 R. P. M. (Load Speed)







It takes a lot of muscle and coordination to ride a rough working, badly lubricated air tool. And that kind of ride takes you nowhere. You can tame it with the Norgren

LUBRO CONTROL UNIT

Make it operate with smooth-flowing power of a thorobred! Keep it working that way by oiling the air that drives the tool... the one right method of lubrication. Also protects against destructive corrosion when tool is idle.

CLEANING - COOLING - LUBRICATING

The Norgen LUBRO CONTROL UNIT combines air filter, pressure regulator, and lubricator. (Each can be used separately.) Sizes, for every purpose.

Automatic: starts and stops with the tool. Sight feed; visible supply and service. Write to C. A. NORGREN CO., Denver, Colo., for latest catalog and price information.

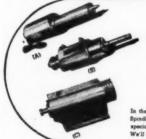


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HERE'S ALL THERE IS TO A

POPE Precision Grinder Spindle



No oil cups, wicks or fittings—the lubricant is sealed in. No chance to inhale dust or grit of any sort. Just a complete, self-contained package ready to work smoothly, coolly and indefinitely at its job of producing superb surface finishes.

There is a size and type of POPE Precision Spindle for every service. Once you try them—see how they perform—you will standardize on POPE Sealed Lubrication Spindles.

Let us mail you new descriptive Bulletin "T" containing complete information.

In the hand is a Tool and Cutter Grander Spindle. At left is (A) a Surface Grinder Spindle, (B) a special Spindle for winding Gloss thread at high speed, and (C) a special Wheel Head for grinding tank and aircraft bearings. You name the job. We'll build the one best Spindle for it.

POPE MACHINERY CORPORATION

ESTABLISHED IN 1920

HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION GRINDER SPINDLES

Use the COMBINATION DRILL TABLE and VISE



SPEEDS DRILL PRESS SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.



Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

Jackson, Michigan

A POWERFUL WEAPON FOR INDUSTRY

THE FAST METAL CUTTING SAW

Wells No.8

On industry's fighting front Wells Saws are among the busy weapons turning out our axis-beating equipment. They are working on the production line - in the tool room - an maintenace and odd jobs - cutting metals and other materials with speed and precision.

Wells Saws are rugged, versatile machines built for Today's tough cut-off problems. And they will be the ideal all around saws for famorrows jobs too!

Call your distributor or phone or wire direct — you can get quick delivery.

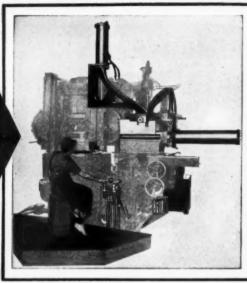
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METAL CUTTING
BANDSAWS

707 COOLIDGE AVE. • THREE RIVERS, MICHIGAN

THE HAND THAT ROCKS
THE CRADLE CAN ALSO
SINK THESE DIES



Turchan Fallowers attach easily to any standard laths, planer, shaper, grinder or mill.

TiME was when die sinking demanded extreme skill and only experts were permitted to tackle the job. Today, however, ingenious mechanical devices such as the Turchan Follower have decreased the possibility of human error and lessened the necessity for such rare skill.

Take, for example, the sinking of drop forge dies—dies of almost every conceivable contour, designed to take a merciless pounding. That used to be a man's job. But today, thanks to Turchan Followers, the hand that rocks the cradle can sink such dies. And do it well!

The accompanying photograph shows a woman in a large forge plant operating a Turchan-equipped vertical turret lathe. She's sinking a die for drop forging an airplane engine part. Notice the easy, all-hydraulic, single valve control. Notice the cutting tool following every movement of the tracer mechanism. Above all, observe that the Turchan is merely an attachment — a relatively inexpensive attachment — to the die sinking machine.

The owners of this machine Juneal is Junchau for faster, better, more inexpensive die sinking. Why don't you June is Junchau? Inquire today.

Turchan;

Send For Our New Booklet . . . IT'S FREE

FOLLOWER MACHINE CO.

Originators of Hydraulic Duplicating Attachments
ois Avenue Detroit 4, Michigan

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PULLERS do the job the **FIRST** for sale sure separation. They time. No Delay. Use **ACRO PULLERS** for sale sure separation. They are fast-accurate—positive. War plants using these pullers report damaged die sets caused by prying or hammering. ACRO DIE SET

ACRO PULLERS are indispensable for the grinding, mounting and are fast—accurate—positive. War plant savings as high as 50% in time alone. ACRU PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, and the punches are indispensable holding the analysis and analysis analysis and analysis analysis and titting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height. Order a set today. Convince yourself of the savings you can make in your tool room. ACRO PULLERS furnished in three sizes. Write now for more information.

now for more information.

METAL STAMPING CO.

332 E. RESERVOIR AVE.

MILWAUKEE, WIS.



Tannewitz METAL CUTTING BAND SAWS

BULLETINS

Worth Writing for:

SHEET METAL CUTTING BAND SAWS

SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE

BAND SAWS FOR DI-SAWING, FILING and POLISHING ... are constantly effecting truly amazing production increases, with corresponding reduction of costs, in the cutting of:

SHEET STEEL and NONFERROUS METALS - BOTH FORMED AND FLAT

CUTTING OFF GATES AND RISERS FROM CASTINGS OF ALL SIZES AND TYPES OF METAL

CUTTING LARGE BLOCKS OF ALUMINUM, MACHESIUM and OTHER METALS

DI-SAWING - INSIDE AND OUTSIDE FILING and POLISHING

The complete line affords machines to accommodate work of any size. Take the first step towards eliminating the bottle neck of metal cutting by writing for bulletins listed at left.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

There are many

ARRAD

Soybeans will certainly be one of the country's important crops in the future. A single acre of land devoted to them will produce about seven times as much protein as it would it planted to corn for the feeding of hogs.

The war has checked the spread of quick-freezing locker plants which were spreading across the country from the farming states at the rate of about fifty new plants each month. A million patrons are already with-drawing two million pounds of food from their lockers daily. Home-sized quick-freezing units will probably be combined with mechanical refrigerators in after-the-war models.

The fluorescent tube may have many uses besides those already familiar. Inks that show under ultra-violet light are already in use to mark laundry, and are being tried out in hospitals for the identification of babies. Fluorescent materials help in the detection of the about the detection of altered documents. Fluorescent lighting distinguishes between butter and margarine, determines the freshness of eggs and nuts, or the adulteration of coffee, lard and olive oil. Experts can even tell, with its help, from what flowers a sample of honey has been made.

Powdered glass is being pressed into shapes and fused by heat in a manner similar to the technique used for powdered metals.

A machine is reported in which a photo-electric cell scans a drawing and operates a machine that produces the part shown in the drawing.

Cotton, laminated with thermo-setting plastics, is being tried as a substitute for sole leather . . . semi-flexible, water repellent, and similar in appearance to leather, but longer wearing.

New "rare-element" glass that contains no sand makes optical glass for camera lenses with twice the speed of any former lens. A new method of cutting metal uses slightly worn band-saw blades run at approximately ten thousand feet per minute. The high speed of the saw actually melts the metal in its path.

Baking dishes can now be made of special paper that resists heat to 350 degrees.

The photo-electric cell (or electric eye) was first introduced to the public as an automatic door-opener. Now it sorts fruit, smoke and fire, levels elevators, records automobile speeds, counts pills, matches colors, sorts merchandise, turns on lights, measures machined parts, detects flaws in metal and is the heart of television. Its use has only begun.

Backyard gardeners will be pleased to know that experiments are being made with high-frequency currents to kill insect pests in the ground. An immediate post-war demand is expected for two million one-hundred thousand automobiles, one-million five-hundred thousand mechanical refrigerators, one-million two-hundred thousand washing machines, one-million two-hundred thousand radios, nine-hundred thousand radios, nine-hundred thousand electric irons, and six-hundred thousand electric sewing machines.

The Basic Magnesium, Incorporated, plant near Boulder Dam, largest single electrical installation in the country, uses eighteen million dollars worth of silver in place of copper to carry its current.

A patent has been issued for a method of transcribing eight hours of continuous reading by variably magnetizing a spool of fine wire the size of an ordinary spool of cotton. With this wire in a radio-like machine, a housewife could attend to her domestic chores and listen to the reading of an entire book at the same time.

A new camera takes three million pictures in a single second.







◆ This particular machine has achieved an outstanding record in the production of shells and bombs. It is arranged with tap for tapping the nose ends of shells and bombs. May be arranged with die heads with which to thread component parts. Also equipped with lead screws to guarantee positive leads and with precision fixtures

for perfect alignment. Capacity Machine Threads

"H" to 2" U. S. S. Inclusive; H" to 2" S. A. E.
Inclusive. Capacity Pipe Threads—H" to 2" Inclusive. Write for descriptive catalogue.

Also ask for catalogue on No. 32 and on No. 42 Thread Milling Machines.

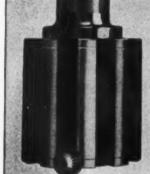
MURCHEY MACHINE & TOOL COMPANY . DEPT. M-2, DETROIT 26, MICHIGAN

MURCHEY

Murchey also manufactures all types of Self Opening Bie fleads and Collepsible Taps. Literature on request.

GREAT LAKES Broach & Gage Company

1005 Franklin St. . . . Detroit 7, Michigan





STANDARDS FROM STOCK

S.A.E. SERRATION
PLUG GAGES

EXCELLENT
DELIVERIES
at the
Present Time

BROACHES:

Round . . . Sectional . . . Keyway . . . Spline . . All Types, All Sizes . . .

GAGES:

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MASTER GEARS and MASTER INDEX PLATES

Splined Arbors for gear-grinding, hobbing, shaving and checking.

GEAR DESIGNING AND ENGINEERING

--- Form Cutting Tools ---

Specialists
in
Manufacturing
or
Re-Conditioning
Hob-Sharpening
Master
Index Plates



SEVERANCE MIDGET MILLING CUTTER GIVES PERFECT FINISH INSIDE INTRICATE CASTING



with a Severance special Ball Cutter, the hard-to-get-at flash edge on this aluminum elbow is quickly and perfectly removed.

Severance Midget Milling Cutters are efficiently finishing castings, parts and patterns made of metals, alloys, plastics and wood. With portable power tool, with stationary set-up or by hand, Severance Cutters do the finishing job cleaner, faster and easier. If you wish to speed up your finishing of manufactured parts send us samples. Our engineers will help you determine the kind of cutter best fitted to your needs.

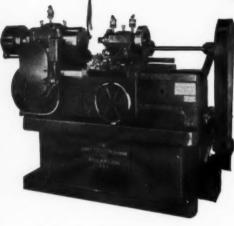
Severance complete line of "Carbide" Midget Milling Cutters are now available.



SEVERANCE TOOL INDUSTRIES INC., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Mich.; Fort Wayne, Ind.; Chicago, Ill., and Los Angeles, Col.

THE COULTER





FOR THE RAPID
DUPLICATION OF
RIGHT OR LEFT
HAND THREADS
—INTERNAL OR
EXTERNAL

Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

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The Rotorex Universal Tool and Cutter Grinder, waccurately perform all kinds of tool grinding operations. Readily interchangeable attachments are usuable to set up machine for single purpose policy and

Operation showing set-up for internal grinding.





Operation showing set-up for sharpening straight gash hobe

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Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

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MODEL "LR" Lo-swing

Illustration at right shows tooling of a Model "LR" equipped for turning an Automobile Transmission Shaft. Equipment furnished consists of one three-slide Front Carriage; two Back Attachments, one carrying tools, the other a two-roll steady rest; one Top Slide; one 45' Undercutting Attachment.

The automatic cycle is as follows: First, the tools on the center slide of the Front Carriage spot the shaft for a Steady Rest bearing; Second, Steady Rest on Back Attachment moves in automatically to support work; Third, all tools start cutting simultaneously, those on Front Carriage turning all diameters, tools on Top Slide face and groove, tools on Back Attachment chamfer and groove while the Undercutting Attachment tool undercuts the head end at a 45° angle. The operation is entirely automatic. Operator merely loads and unloads and pusshes starting lever.



UNLIMITED TOOLING POSSIBILITIES ARE AVAILABLE WITH THE LATEST TYPES OF AUTOMATIC Lo-swing LATHES



Lo-swing

At left is a close-up illustration of an Imp Lathe equipped for turning, facing and rough and finish grooving aluminum pistons on a production basis.

The work is held and driven by an air-operated Wrist Pin Type Driver. The three tools mounted on the front carriage turn the skirt, ring groove lands, and round the end of the piston, while simultaneously the tools on the top slide face the end and rough turn the grooves. Immediately these tools have ceased cutting, the finish grooving tools on the rear slide finish the grooves to close tolerances.

The cycle is automatic...the operator simply loads and unloads the pistons and pushes the starting lever.

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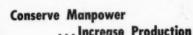
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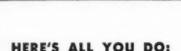
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Specifications

Model 3F. Induction-type motor, 1750 rpm. 2–10° dia., 1¼° Carborundum wheels, one coarse, one fine. Complete safety equipment. 51° high, base 20°x15°. Spindle dia., ½°. Tool rests, accurate and adjustable.

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4 of the 101 uses of the UNIVERSAL INDEXING HEAD

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Square or odd-shaped pieces may easily be held as shown. Simply weld a plate to round shank, insert guide pins and clamp firmly. Read the 3 graduated dials for exact duplication.

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Straight or taper-shank tools which have a shank too large to fit the quill are easily and accurately ground as illustrated at right.

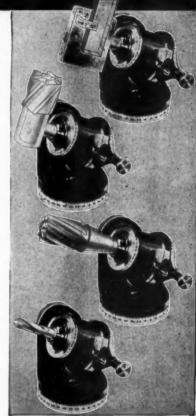
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4 Booth type bench for magnesium casting finishing.

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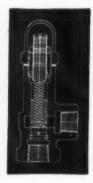
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MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

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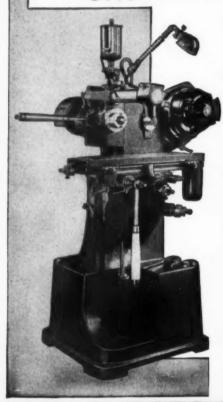
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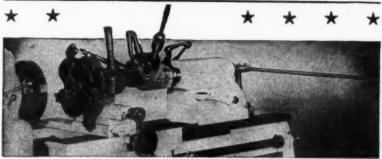


Photo above shows Jefferson Turrets on 16" lathe



71/2" Swivel Base Dividing Head IMMEDIATE DELIVERY

Convert YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Yes, it's as easy as that!
You simply attach the
Jefferson Tail-Stock Turret, the Jefferson
Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in

The productive capacity of these machines will be more than doubled in many instances because there will be avoilable at all times NINE DIFFERENT

TOOLS.

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24"



5-Tool Tail-Stock Turret

PAT, PENDING



6" Tilting Dividing Head with 3 Indexing Plates and Tailstock— Immediate Delivery,

Some territories still open for dealers and salesmen.

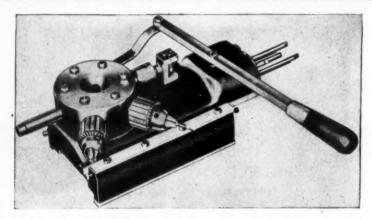
Jefferson Turrets are real production tools— sub-stantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

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Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratory Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises

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Kessler Aero Self-Indexing Bed Turret has 6 tool stations and 6 stops — Can be back indexed by hand, speeding production — Index bushings and lock pins are hardened and ground tool steel — Turret head mounted on pre-loaded Timken bearing that is easily adjusted for any wear — Ways are hand scraped — Turret shipped completely finished and assembled except for turret holes which are left to be bored on your lathe for maximum accuracy of ports.

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KNOCK-OUT UNIVERSAL CARBIDE TOOL GRINDERS . . .

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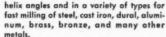
CARBIDE-TIPPED

Gal-Cutters

make the difference!

THERE'S nothing extra to buy—no special skills required—when you put the new Cal-Cutters on the job! But these husky carbide tipped tools enable you to get more work out of your milling machine by using higher speeds and feeds than possible with high speed steel cutting tools. These long-lived Cutters reduce downtime for re-sharpening, too, provide better surface finishes, cut cost-per-piece to the core.





The new Cal-Cutter Catalog H-1 describes, illustrates and gives specifications on the latest Cal-Cutter types for a complete range of milling requirements. Write for your free copy today!















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1915 EAST STATEST . LOS ANGERES IL CALIFORNIA
HORIZONTAL MILLS, VERTICAL MILLS und

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

Rickert Shafer

MODEL "C" Automatic

Self-Opening DIE HEAD

• REVOLVING TYPE



* EASY TO REMOVE AND REPLACE CHASERS — just Nip the thumb latch and chasers are free.

• SIZES from 9/16" to 2



* GETTHE ---JOB DONE!



You can RELY on Marshall-town Presses TO STEP UP YOUR PRODUCTION! They are engineered and built to give you the best in dependable, trouble-free service, and they incorporate many outstanding advantages. Features of design include more die space—chrome molybdenum cranks, wrist pin connections.

Yes, for better production for longer life—for the MOST FOR YOUR MONEY—choose

MARSHALLTOWN PRESSES Get the facts today

Presses. Send for literature of the complete line capacities from 5 to 70 tons.

MARSHALLTOWN MFG. CO. 900 E. NEVADA ST., MARSHALLTOWN, IOWA



Can be used on any machine that has a "T" Slot in the table.

Furnished in plain and vernier type.

The plain dresser is graduated in degrees. The vernier dresser reads in degrees and minutes. The vernier is cut into the base block, thus eliminating the possibility of error that might arise if the vernier was made a separate piece. separate piece. One diamond fur-nished with each dresser.

Plain Type Dresser, \$72.50

Vernier Type Dresser, \$85.00



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FLEXIBLE SHAFT MACHINES

Illustrated: Model 2-A

The Wyco 1/2 h.p. single speed general purpose machine. For machine shops and for wood or metal sanding. An invaluable all-round machine for every shop!

for YOUR Needs!

There is a rugged, heavy duty Wyco Flexible Shaft Machine built to your standards and your requiremental Floor types, Bench types and suspension

Today, Wyco machines are doing triple duty and types! 31 models. standing up under it! When you buy a flexible shaft machine, remember that WYCO has already stood the test. Be sure to get the right machine and correct unit of power for your job - write for the

Every WYCO machine has the WYCO Patented Non-Metal. lic INNERLINER.

Prolongs shaft life-Makes the core last longer -

Runs smoother -Transmits more power.

WYZENBEEK & STAFF, INC. new WYCO catalog today!

838 W. HUBBARD ST.,

The SUNNEN PRECISION HONING MACHINE

"Will pay for itself many times over in the saving of scrap parts and time"

Massey Machine Company

The drawing shown above is of a steel part from a 20 MM aircraft gun. By former methods of honing, too many of these parts were being rejected because they were being cut oversize with no means of solvaging them.

, A consultation with a Sunnen Service Engineer led to the installation of the Sunnen Precision Honing Machine to handle these finishing operations.

Consider These Advantages

Wide range—handles internal diameters of .18.5" to 2.625". Accuracy within "one-tenth" guaranteed—has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical—inexpensive—exconomical to operate.

Put Sunnen Honing to work in your plant!

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Aircraft Instrument Panel Control Wire Bushing, Hole 187" diameter — held to .0002", stack removal .001", sixty per hour.





Stainless Steel Load Compensator Valve Seat, Haldis haned to .0002" limit



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.



Alreraft Corburator Oper ating Valve Sleeve, Sunna honing eliminates distortion



Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-



Aircraft Platen Pin. Sunner honing is twice as fast and gives a cleaner, better lacking nice



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practicelly



Bearing. A very small part. 2 micro-inch finish necessary.

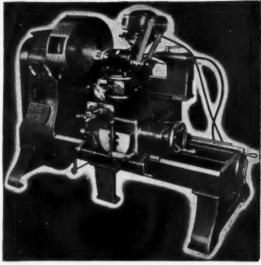


Aircraft Valve Tappet Roller. Moned after grinding to give 100% bearing



Automobile Distributor Shaft Gears. Toper removed at a rate of 80-90 per hour.







THUNDERBOLT TAILFORKS..

Three types pictured above are all ground to .0002" tolerance fast, accurately, and easily on the new Lempco Model HGX.

MODEL HGX GRINDERS \$3750 GOOD DELIVERY

MORE THUNDERBOLTS ROAR BECAUSE THE LEMPCO MODEL HGX FINISH GRINDS THEIR TAILFORKS FASTER!

The big 53" swing on the new Lempco Heavy-Duty Universal Grinder is just what the doctor ordered for grinding these fighter craft tailforks. Only one set-up required to finish both bearing lands on this difficult to handle odd-shaped one-piece forging. Turns and grinds, internal, external, face and taper jobs too. 3 Quick-change speeds for both cross-feed and table feed. 360° Compound. Automatic trips and feeds insure skilled work — even from apprentices.

WRITE FOR CIRCULAR

TEMPCO



THE simple, fast repair of this single angle milling cutter is typical of the thoroughly satisfactory results being obtained in the many shops now reclaiming broken cutting tools of all kinds with the low-temperature silver brazing alloy EASY-FLO.

Here's how this particular job was done. The four broken surfaces were thoroughly cleaned and fluxed and then tinned with EASY-FLO wire. After refluxing the surfaces, one part was clamped in a vice and the other carefully positioned on top of it, alignment being checked with a straight edge. The entire cutter was heated uniformly with a torch and when the alloy flowed, a little pressure was applied on top with a rod to help settle

the parts into place. The whole job was done in 20 minutes with less than 2" of 1/16" EASY-FLO wire. Two chipped teeth were later built up with a high melting point alloy without affecting the braze.

FOR EASY-FLO DETAILS WRITE FOR BULLETIN 12-A

It tells all about EASY-FLO's low-working temperature, exceptional fluidity and the remarkable strength joints it makes—the factors which combine to make practical fast, inexpensive tool repairs. It also gives a lot of useful information about metal joining. Write for your copy today.



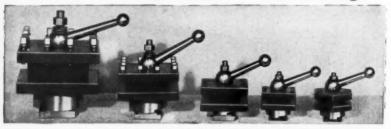
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82 FULTON ST., NEW YORK 7, N. Y.

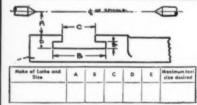
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ENCO Turret Tool Posts

Accurate • Dependable • Cost-Saving



'A" Dimension range (from diagram on	Model 6-S		Model 31/2-S	Model 21/2-S	Model H
this page	2"-3-1/8"	1-9/16"-2-1/2"	1-1/8"-1-3/4"	7/8"-1-5/16"	7/8"-1-5/16"
Lathe Swing	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Bench Lathe
	1" or 1-1/4"	3/4" or 5/8"	1/2" Sq.	3/8" Sq.	3/8" Sq.
Maximum tool bit	1-3/8" tootholder for 3/8" bit (Where no tool bit size is specified, tur- ret will be furnished for 1 inch tool bit)	(Where no tool bit size is specified, tur- ret will be furnished for 5-8 inch tool bit)			
SPECIFICATIONS	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds Price . \$99.00	4" square Packed in carton Shipping Weight 12 pounds	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds Price . \$35.00	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds Price . \$23.00	3" Hex Packed in carton Shipping Weight 4 pounds



One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired.

- 12 position indexing
- 3 positions for each tool
- Carburized hardened steel construction
- Mounts rigidly in compound T-slot
- Keeps setting accurately
- Indexing is self-contained. Eliminates all chip interference

IMMEDIATE DELIVERY

on Turrets for these lathes: Atlas • South Bend • Logan Sheldon • Clausing

Also all models with semi-soft base on center post for quick adaption to your lathe.

Most ENCO dealers carry complete stocks of the above Turret Tool Posts and ENCO Tailstock Turrets. Chicago and New York offices too can make immediate shipment.

ENCO MANUFACTURING COMPANY, Dept. W

General Office and Factory: 3321-23 MONTROSE AVE., CHICAGO 18, ILL. Eastern Sales Office: (Complete stocks carried) 118 E. 28th ST., NEW YORK 16, N. Y.

ENCO Heavy Duty



HD-1	HD-2
4-1/2" Sq. 3" thick	6-1/2" Sq. 4-1/4" thick
I" or I-I/4"	I-I/4" to I-3/4"
3/4"-1"	1"-1-1/2"
2"-3-1/4"	3"-4-1/2"
2-3/4"	4"
\$99.00	\$130.00
20 lbs.	45 lbs.
	4-1/2" Sq. 3" thick I" or I-1/4" 3/4"-I" 2"-3-1/4" 2-3/4" \$99.00

Capable of taking the strain of hogging cuts under high speed. Designed to mount maximum tool bits. Tool overhang is cut to minimum in these heavy duty models by

the tools being mounted directly over the base of the turret. This increases the tool rigidity, permitting a heavier cut which reduces lathe time. 12-position tool indexing adds versatility to the rugged design of this accurate, cost-saving tool.

Models HD-1 and HD-2 can be shipped from stock with semi-soft base which can quickly be adapted to your lathe. Two weeks required for turrets fitted from specifications. When ordering turrets to specifications please furnish all dimensions shown on the lathe specification chart. Be sure to specify maximum tool to be used.

ENCO CROSS-SLIDE TURRETS for Turret Lathes and Screw Machines

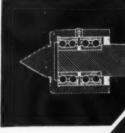


	MODEL D-3 for HEAVY DUTY	MODEL D-2	MODEL D-1	MODEL D-1 for LOGAN TURRET LATHES
Size of Turret Block	4½" square 3" thick	4" square 214" thick	3½" square 134" thick	312" square - 134" thick
Tool Size Range	up to 114" tool or 138" toolholder for 38" bit	58" or 34" tool	36" or 1/2" tool	3g" tool
Price	\$129.00	\$79.50	\$59.50	\$52.50
Shipping Wt.	35 lbs.	20 lbs.	11 lbs.	9 lbs.

ENCO Cross-Slide Turrets for Screw Machines and Turret Lathes increase the tool capacity of the cross-slide 4 to 1. Each of the 4 tools mounted in the turret block has 3 different working positions. Each of these tools may be used for more than one operation reducing set up and grinding time. The base is bolted rigidly to the front of the cross-slide and keyed in place. The turret block and center post are carburized hardened steel and designed to give long and accurate service with minimum care.

Write for Turret Lathe Chart to Assure Accurate Fitting To Your Lathe

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4 Rows of Precision **Ball Bearings**

RO Precision

QUADRO Precision LIVE CENTERS QUADRO Precision LIVE CENTERS will outlast old-toshioned solid centers to pay for themselves to pay for themselves to pay for themselves to pay for the rigid combine the rigid to pay for the solid lathe center with the frictionless properties of the

ball-bearing to form a tool which will increase production Manufactured accuracy. accuracy tured in all tapers and sizes.

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TOOL AND MACHINE CO., INC.

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NON-BREAKABLE

Hackmaster

MOLYBDENUM HIGH SPEED STEEL

Hackmaster .

The back of the hand Blade is annealed so as to make it unbreakable, and the tooth edge is hardened for durability. It has all the cutting qualities of the standard Molybdenum High Speed Blade. May be used under all awkward sawing conditions, or by inexperienced men, with complete satisfaction and fast cutting speed. Sharp twists and kinks, which are the main reason for saw breakage, are absorbed without damaging this HACKMASTER Blade.

Stocked by LENOX Distributors in your territory.

AMERICAN SAW & MFG. CO.

SPRINGFIELD, MASS.





Industry Rushes On

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CONWAY CLUTCHES

Patented in U.S.A. and Canada

Scores of models . . . special designs for special purposes . . . whatever the need, there's a Conway Clutch to speed on its endless way silently, smoothly, efficiently.

In every model you get performance because of:

instant starting and stopping drag-free idling large lever ratio ease of engagement centripetal action full length bearings no exposed actuating parts sturdy, dependable construction and many other features.

Reasonable deliveries on catalog models. Write for your copies of bulletins.

Gear tooth drive Triple Plate Mechanism



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1541 Queen City Avenue CINCINNATI, OHIO

To Solve

DRIVE PROBLEMS ALL YOUR

Machine Tools are only as modern as their Machine Tools are only as modern as ment drives which means that if you're to get drives __which means that it you're to get moximum output from the available machines maximum output from the available machines and manpower, the drives must be engineered for your machines.

That's why you're ade in putting your That's why you're sale in putting your drive problems squarely up to Berkeley.

Berkeley has always pioneered in drive development.

Berkeley is in position to supply the proper size and type of drive for almost any machine tool Every Berkeley drive is designed and built specifically for the tool

lis to drive — and to deliver exactly the service was remained. Every Berkeley drive is designed and built specifically for the service you require.

It is to drive—and to deliver exactly the service you require. Without any obligation on your part, let our Engineering Depart, ment tell you how to get more work and more profit out of the machine tools you now have and the men you have to run them. chine tool.

Anyway, let us send you copy of our new bulletin showing the different types of Berkeley drives, along with typical installations.

LET US SEND YOU DETAILED FOLDER

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MACHINE TOOL BLUE BOOK

For Smoother Performance



USE ATLANTIC Contour Cutting BAND SAW BLADES

You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear and you can weld them easily.

IMPROVED PACKAGE

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Box is solid chipboard construction that won't come apart. Saw

securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.





ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively
153 Brewery St., New Haven, Conn.





Grobet Hand Cut, Milled Cut and Ground Cut ROTARY FILES can now be purchased in units of 50 to 100 in special shipping container, without extra cost. This strongly made box is ideal for use in place of a rack. Files do not touch and are kept clean and in perfect condition. Also used to return files for

Send for Catalog MR, most complete of its kind, illustrating and describing GROBET ROTARY FILES, DIESINEER'S BURS, TUBE BURR-ING CUTTERS, CHATTERLESS COUNTERSINES, etc.

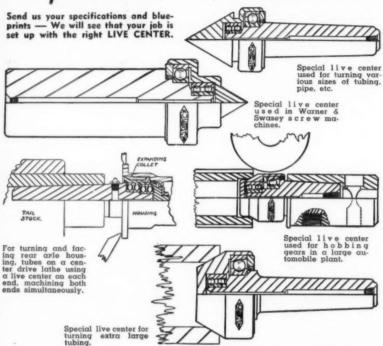
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Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . . that compensates for expansion due to heat, shock and excessive thrust loads — reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock — prompt deliveries on high priorities.

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MOTORIZE With

GEARSHIFT DRIVES FOR MACHINE TOOLS REQUIRING SELECTIVE SPEEDS...



Large enough to successfully serve you, yet small enough to give personal attention to your needs.



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REPRESENTATION IN MOST PRINCIPAL CITIES LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS





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The strict tolerances of aviation standards demand precision . . . far beyond the scope of mass production.





Model 2 Moto-Tool, complete with accessories, as illustrated, in felt-lined hardwood case— \$23.50. Model 2 Moto-Tool only, with emery wheel point — \$16.50.

27,000

plants as Conoral Electric, Westinghouse, Romington Arms, Ford, Nosh-Kervingtor, Conselldeted Aircraft, Douglas and Northrup Aircraft, and energy similar "Arrenges of Democrats."

Ming invitate dies. Used on production lieus to clean castings, turnings and forgings . Ladron fools and do fundiness of printing finishing, politiking, barring, restling and atching approximations.

Granel Mate-Tool has AC-DC mater with seck-prest bakelite housing, oil-sealed (eli-less) bearings, and built-in cooling fan. Weight say it is a sealed to the sealed to th

bremel Moto-Teels are proving indispensable side in speeding up was production in such

10 DAY TRIAL

Try e Dramel Moto-Tool on your own labe by your own shop. See how vorsattle, how indispensable it is—how it noves time and materials. Order from your distributor. If he cannot make you—write factory. PROMPT SHIPMENT on orders with proper priority.

Whether you have a Mote-Teel or any other typt of grinder, use only genuine Dremet shop-tested Accessories — sheel cuttors, emery whoel polytic, brushee, sonders, etc. Write for Mearstan.

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DREMEL MFG. CO. Dopt. 214-B RACINE, WIS.U.S.A.



Elgin's contribution to America's all out War Effort includes Bench Milling Machines, Hand Screw Machines, Bench Lathes — all high precision machine tools essential for the multitude of

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Elgin precision tools possess mechanical advantages and refinements that permit fast and accurate work to close tolerances plus sturdiness and all-round dependability. Sustained accuracy is assured by adequate design and scrupulous care in construction.

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VERTICAL MILLING MACHINE

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WRITE FOR DETAILS



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PURE TUNGSTEN CARBIDE DIAMOND METAL HONES

\$12.00 EACH

SUPPLIED IN THREE DIAMOND GRIT SIZES

No. 1 COARSE......100 GRIT DIAMOND No. 2 MEDIUM......150 GRIT DIAMOND No. 3 FINE......250 GRIT DIAMOND

WHAT THEY DO: To resharpen carbide tools. Stoning small radii on carbide tools. Dressing short angles or small radii on diamond wheels or abrasive wheels.

These hones are very fast cutting and have an extremely long shop life. They are very difficult to harm in ordinary use. Use kerosene or light oil as a lubricant. To resharpen, bring diamond face lightly in contact with a silicon carbide wheel for about 30 seconds to one minute. The silicon carbide wheel will grind out a small amount of the Tungsten Carbide binder and re-expose the diamond particles.



Lasts from five to ten times longer than Bakelite Diamond Hones. A trial order will convince you of their worth.

IMMEDIATE DELIVERY FROM STOCK

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CIRCULAR AND DOVETAILED FORM TOOLS

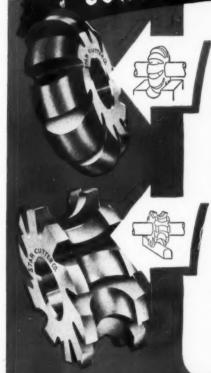
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LET us supply your needs for concave and convex cutters, either standards or specials.

A complete stock of standards, which can be shipped within 24 hours of the receipt of your order, is carried at all times.

If you are interested in fine cutting tools, which bear the name of a company that has been 15 years in the cutting tool business, then write us today for prompt quotations.

We manufacture side mills, special form cutters, multithread cutters, unground hobs and other cutting tools, either special or standard.

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How to do turret lathe machining on your engine lathe!

THESE 3 SPECIALTIES LATHE ACCESSORIES MAKE IT POSSIBLE



SPECIALTIES CROSS-SLIDE TURRET

Enables you to do multiple machining operations on the same lathe. Easy to operate, merely flip the turret from one index position to another.



SPECIALTIES TAIL-STOCK TURRET

Quickly converts engine lathes into 4-way turret lathes for end work. You perform four different operations without time loss for tool changes.



SPECIALTIES LATHE STOP

Eliminates repeated measuring . . . speeds up production. You measure only once for each operation. When positions are set, you just index.

Mail the coupon for complete information

SPECIALLES MANUFACTURING CO., INC.





Featured In This Issue

ELECTRONIC applications will be used widely in future machine work. C. T. Pearce of the Westinghouse Company tells some of the things that are being done and will be done in this important field, in the story beginning on page......127 PRESSES of many new types will be used for new jobs, and for doing old jobs faster in the post-war field. Some of these presses are presented in the story commencing on page..... TOOLING is responsible for the present high production rate of Flying Fortresses. Frank V. Faulhaber describes some of the things Boeing has done to put Flying Forts on a modern production basis, in the story commencing on page......161 WAGE and Salary Stabilization is a topic about which considerable confusion has arisen. Herbert Burstein, a member of the New York bar, discusses rulings on this important subject in the story commencing on page..... MODERN MILLING Practice is the subject of John E. Hyler's contribution starting on page......199

HIGH SPEED MILLING, particularly slotting operations in steel, are described in story commencing on page......213

TAXING Investment Profit is being considered as a possible source of revenue. Arthur Roberts reviews the project pro and con, pointing out all the potential implications, in a story commencing on page . 223

C-F POSITIONERS

Safety, Economy, Speed PLUS Better Welding!

C-F Positioners eliminate handrage rews and crame work, clear floor space, reduce accidents and make every weld a faster, better weld! Tilts 135° beyond horizontal, with a 360° table turn, assuring the proper welding position in the most inaccessible corners!

Adaptable too! C-F Positioners answer many other positioning and handling problems! Many sizes and true-rated capacities. Hand or power operated.

Write for Bulletin WP 22



Cullen-Friestedt Co.

1321 S. KILBOURN AVE.,

CHICAGO 23, U.S.A.

SOUTH BEND TOOLROOM LATHES

ACCURATE - VERSATILE - DEPENDABLE





TRAINING HELPS

South Bend sound films, books, wall charts, and bulletins are available for training lathe operators. Write for Bulletin 21-C.

* BUY WAR BONDS *

Matching industry's need for greater efficiency withtheir accuracy, versatility, and dependability, South Bend Toolroom Lathes aid the war effort both on the production and toolroom operations. Their capability for machining plain or intricate jobs quickly and with a minimum of effort makes them valuable wherever exacting machine work must be done.

South Bend Toolroom Lathes and Engine Lathes are made in five sizes, from 9" to 16" swing. South Bend Turret Lathes are available with 9" and 10" swings. Write for catalog.

SOUTH BEND LATHE WORKS
Lathe Builders For 37 Years - South Bend 22, Indiana



As The Editor Sees It

PROGRESS has been made in reducing industrial accidents. Yet the rate is far too high.

Since Pearl Harbor, 37,600 workers have been killed. That figures 7500 more than our military dead.

Permanent disabilities have mounted to 210,000. Temporary disabilities have totaled 4,500,000, which is 60 times more than the military wounded and missing.

Aside from all the suffering and grief, this heavy

accident toll is hampering the war effort.

The death or disability of a skilled worker here can mean the death of several fighting men overseas, if "too little arrives too late."

Since Pearl Harbor, lost time from on-the-job accidents have amounted to more than 540,000,000 man-days—sufficient to have built 7500 average-size merchant ships — 12 times the submarine toll of American shipping in the Western Atlantic.

Measuring the coming war production requirements against the current manpower loss due to accidents in industry, it is obvious that industrial safety is a major war problem. As Paul V. McNutt recently emphasized, we have an untapped reservoir of manpower in accidents that do not have to happen.

What we need is a real second front on safety which will make preservation of lives and limbs a live daily issue in the human contacts at the production-line level.

Just remember that every accident helps Hitler and Tojo.

Wesley G. Paulson



New Data with Alloy Shipments From large and complete stocker



Time and money saving information is included on Ryerson Alloy Steel Reports furnished with each shipment of alloys. This report sheet gives you more complete data than has ever before been furnished with steel shipped from stock. A separate report is supplied for each heat and all heats are easily identified through color markings and heat symbols.

From large and complete stocks at Ryerson you can select the alloy steel best suited to your needs. Call your nearby Ryerson plant for quick action on alloys—or any other kind of steel you require. Joseph T. Ryerson & Son, Inc.

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

AN Electronic PRIMER

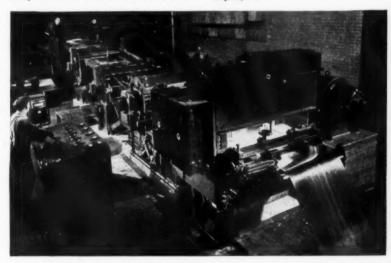
by C. T. PEARCE



E LECTRONICS might be defined as the science of the electron in space. It is distinguished from other branches of electrical engineering in that it deals with the handling of electrons "in the raw" as it were. That is, where they flow across an evacuated or gas-filled space in a tube, rather than thru a copper wire.

Electronics is not a new science, altho the general public has not been made very well aware of it until recently. Many of the fundamentals of electronics have been known for several years, but the first general application was in radio. Electronic devices are now found in practically all fields of industry, and there has been a very sharp increase in their usage during recent years. In some instances, they have permitted the development of entirely new applications. hitherto unknown because no equipment

*Manager, Engineering & Service, Westinghouse Electric and Mfg. Co., Philadelphia, Pa.



Electric eyes spot pin holes in tin plate that no human eye can detect. This electronic set-up automatically spots, classifies and marks minute holes smaller than 1/64" in tin plate racing thru a shearing line at one thousand feet a minute.



Senior engineers, Gordon F. Jones (left) and Charles A. Madsen, are shown examining the elements in a partially dismantled 100 kw oscillator tube, similar to those used for high frequency induction heating and radio broadcasting.

was available to give the desired results. In others, they have replaced or supplemented the existing forms of equipment, because they do the job better.

The present conception of matter is that each element is made up of infinitesimally small bodies known as atoms. The atom, in turn, is composed of a number of still smaller particles. Some of these particles have a negative electrical charge, while a corresponding number have a positive charge; thus keeping the system in electrical balance. The negative particles are called electrons, and are assumed to rotate about the positively charged particles in the nucleus, just as the Earth and the planets revolve around the Sun. The various elements differ in the number of electrons and in the arrangement of their orbits around the nucleus. This obviously does not cover all of the ramifications of the atomic theory, but is sufficiently complete for our purpose.

In the war effort, many things are being accomplished by electronics which have never been done before. It will make a thrilling and enlightening story when all can be told.

Meanwhile, industrial application of electronics will constantly increase. In this contribution Mr. Pearce covers some electronic fundamentals and gives a hint of the larger and more important things to come.

An electric current is therefore represented by a flow of electrons. One ampere of current requires a flow of over six million billion electrons per second, so it is seen that we are dealing with very large numbers of very small particles.

It has been found that, if all air is removed from a chamber, electrons flow rather freely across this space, when subjected to a voltage. This flow is greatly increased if the electron-emitting material is heated. Certain types of materials will also give off electrons, if light is thrown on them. This flow of electrons is increased many times if the chamber is filled to a low pressure with certain types of gases. The flow of electrons can be readily and accurately controlled by use of the proper control elements placed inside the chamber. This theory can be used to explain the results obtained in most electronic tubes. It also permits an accurate prediction of performance.

From this, it follows that practically all electronic devices have these things in common:

1—They utilize a highly evacuated chamber. However, this space may be filled to a low pressure with an inert gas or vapor.

2—They have a negative terminal known as a cathode, for the source of electrons. This cathode may be a plate, coated with a special material, and relying upon either heat or light for its emission properties. It may also be a pool of mercury.

3—They have a positive terminal, known as an anode, to collect the electrons, Care is exercised to reduce the electron availability of the anode.

4—They frequently utilize one or more additional control elements, usually referred to as "grids", between the cathode and the anode.

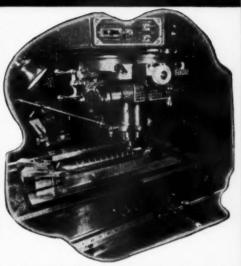
5—As long as one main terminal is maintained as a cathode, and the other

ROTARY HEAD MILLER ... PLUS CHERRYING

ATTACHMENT . . . SIMPLIFIES THIS "TRICKY"
MILLING OPERATION

The Milwaukee Rotary Head Miller equipped with a cherrying attachment made "short work" of the "tricky" milling required on this injection mold. It took just two hours to complete the job—far less time than by any other method known.

The cherrying attachment is an auxiliary rotary head, mounted at 90° to the head of the miller. It is used to mill circles and angles in a vertical plane. When used with rotary head motion, spherical and conical cavities can be accurately and rapidly milled — in almost all cases difficult operations become a comparatively simple task.





KEARNEY & TRECKER'S ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT... mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine—trans-

mits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C for complete information on the Milwankee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies.

Rotary Head Milling Machine Autometric Jig Borers Center Scope Rossney & Treelier

Milwaukee Face Mill Grinder Milwaukee Midgetmill Milwaukee Speedmill as an anode, these devices are inherently rectifying. This explains their wide usage in converting from alternating to direct current.

Most of the advantages of electronic devices come about because they handle the smallest indivisible particle of energy, the electron. This largely explains their flexibility and adaptability and their ease of close and accurate control. This principle may be crudely illustrated by considering a large pile of bricks. As long as they exist as a pile of bricks, they can be transported readily and many different uses can be made of them. As soon as they are fabricated into buildings, however, they must be transported as very much larger units, and their flexibility of usage is very greatly curtailed.

Here are some of the technical advantages peculiar to electronic devices:

1—They can detect infinitesimally small amounts of power and then amplify them into usable or measurable quantities. Regardless of the ratio of amplification, faithful reproduction is obtained.

2—They give practically instantaneous response and perfect sensitivity, as compared to the time lag and sensitivity tolerance always present in mechanical devices.

3-They are inherently rectifying.

4—They permit control of the application of power in periods of fractions of a second, without the use of an arc-interrupting device. This is true whether handling a fraction of an ampere or thousands of amperes.

5—They can be used to transform light energy into electrical energy, as illustrated by the well-known photo tube.

6—They have no moving or rotating parts. This makes for less wear as well as easier foundation and mounting problems.

7—They can be used to generate waves of energy at any desired frequency. This characteristic is used in producing high frequency waves for X-rays, internal heating, germ killing, etc.

It should be pointed out that the great majority of electronic devices are actually electronic only in part. The growth in the use of electronic tubes has been made possible only by the development of the necessary associated apparatus and circuits. The same undoubtedly will be true of future applications of electronic equipment. The circuit apparatus necessary to apply electronic tubes, requires from four to 200 times the value of the tubes themselves.

Here are a few of the more important present uses of electronic devices:

The familiar radio receiving set, already mentioned, depends on electronic tubes to amplify the very weak signals received over the air, so that they can be heard



Balancing rotors for motors while running at normal speed is done by this electronic dynetric balancing machine. By means of a stroboscope, the operator sees the spot on the revolving rotor that is out of balance and reads the amount directly on the meter. In this way, the exact location and amount of corrective mass necessary to eliminate vibration can be determined readily. Rotating parts may be of any size from massive aircraft crank shafts to small automatic pilot rotors, measuring unbalanced vibrations as s m all as twenty-five-millionths of an inch in as short a period as 45 seconds.

INGERSOLL CUTTERS AND **CUTTER GRINDER**







NX FACE MILLS are recommended where a cutter of general application is required capable of taking heavy cuts on both periphery and face in steel or cast iron.





END MILLS with solid shanks are designed for milling small faces, steps, or grooves; or for heavy cuts with stock to be removed by both face and periphery of cutter. End Mills are also available with Ingersoll helical blades illustrated at left.

limited to flat surfaces.

CUTTER GRINDER shown above will grind in a single setting of the cutter the face, periphery, and corners. Capacity, 4" to 30" in diameter with 7" maximum peripheral face. It will grind face mills, solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate. and may be operated by the average mechanic. Write for Catalog No. 54 for complete details and operating instructions.



SIDE MILLS and Staggered tooth slotting cutters of all types are manufactured by Ingersoll for a wide range of applications from very light cuts to railroad rod channeling.

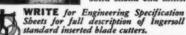


HELICAL SLAB MILLS are efficient and renewable inserted-blade cutters with blades forged, twisted, hardened, and then ground to true helix to fit accurately helical milled slots in body. Also made as solid shank end mills.





Ingersoll manufactures a complete line of inserted blade type milling and boring cutters for all purposes. Your inquiries will receive prompt attention.





Electronic tubes serve as power switches for many electric resistance welders and because there are no moving parts, maintenance is reduced. In this scene, brackets of .093" enamel stock are being spot welded to metal housings of .050" enamel stock by air operated spot welding machines using electronic contacters. A precision sequence timer (Weld-O-Trol) regulates the welding current supplied to the points and the number of strokes per minute.

in the loud speaker. Electronic tubes are also used at the broadcasting station to transform and amplify sound into radio waves.

Television relies upon electronic tubes at both the sending and receiving ends, to handle vision as well as sound.

Carrier current relaying has been in use by electrical utilities for a number of years. It uses the high voltage transmission line for the purpose of handling high frequency signals, as well as its normal duty of carrying low frequency power current. Its use serves to improve transmission line performance by the reduction in relay operating time. Electronic tubes are used to place the high frequency signals on the line at one end and remove them at the other. The same

principle can be used for communication and long distance metering.

The photo-tube or electric eye is a very important member of the family of electronic devices. It responds to light, and may be made sensitive to any desired color. Therefore it can be used for colormatching purposes. Photo-tubes also may be made sensitive to wave lengths outside the visible spectrum, i.e., infra-red, or ultra-violet. This makes them suitable for use in burglar alarms. The photo-tube has opened up a veritable host of applications for counting, scanning, or for control of any operation which can be accomplished by interrupting or reflecting a beam of light. Some of its uses, in addition to those already mentioned are the counting of objects or persons, detection of defects in fast moving objects.



NON-LUBRICATED FLEXIBLE COUPLINGS

Correct misalignment, take up shock and vibration, most efficiently. Send for Catalog, full line,

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Bores 13/4" to 13/4"
2.8 h.p. up.



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The lower your buying costs, the lower will be your producing costs. And in peacetime just as now you will keep on saving money by purchasing from your \$\phi\$ Industrial Supply Distributor—using him as your

central source for all materials and parts, instead of scattering your orders among the manufacturers.

Today and tomorrow—before you order Cle-Forge High Speed Drills, Peerless High Speed Reamers, or other supplies—check with your Industrial Supply Distributor.

He probably can send what you need from stock—or already has it coming in. It saves your time—it helps keep your production rolling at top schedules—to

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The CLINOMETER Vernier Angle Gage gives direct accurate reading of all angles and inclined surfaces to 1 minute. It is sturdy, light, simple; can easily be carried to any job, ready for immediate use. The aircraft, metal-working, plastics, wood, and all construction industries find the CLINOMETER indispensable for precision measurement of all angles.

Prompt delivery on limited quantity.

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representatives.

ENGIS EQUIPMENT COMPANY 310 South Michigan Avenue Chicago 4, Illinois tension control, door opening, automatic elevator leveling, temperature control, and thousands of others. It is probably the most popular of any type of electronic tube for industrial use,

In the broad field of control, electronic devices are already used very widely. In this catagory are super-sensitive voltage and speed regulators, precise speed control of electric motors over a very wide range and the control of operations from such variables as temperature, speed, time and light.



When welding fixed plates or plates of brass or stainless steel that cail for careful and critical welding, the material is welded in several heating and cooling steps intermittently. The overall weld timing sequence is subdivided into several "heat" and "cool" steps, each ranging from 3 to 30 cycles. This timing is now done by an electronic controller using plug-in telephone type relays for compactness, and Thyrotron tubes to actuate them. To establish the automatic timing sequence for the job at hand the operator simply places the plugs in the proper holes in the panel of the controller.



Here is a new handbook for the man who uses taps — to help him get more production — to help him cut better threads.

Realizing that even the best tap will not give good service unless used correctly, Threadwell has prepared this book. It is written in simple non-technical language and yet it covers all of the important things you should know about taps and their use. You can get your copy of the new Threadwell TAP BOOK from your Threadwell distributor or by writing directly to the—

THREADWELLTAP AND DIE COMPANY - GREENFIELD, MASSACHUSETTS, U.S.A.



Resistance welding of certain types of material would not be possible without the use of a power size electronic device known as the "ignitron". It feeds thousands of amperes into the weld but for periods of one-hundredth of a second or less. It is only by applying tremendous heat very momentarily that several of the modern alloys can be welded satisfactorily. This has been a great boon to industries engaged in the fabrication of materials.

The "ignitron" is also utilized for the conversion of alternating current to direct current in large quantities. It therefore finds application in the chemical industry, where a great amount of direct current power is required for electrolytic purposes. Reference is made in particular to the production of aluminum and magnesium. The "ignitron" is also used widely in the transportation industry for supplying large blocks of d-c power.

An air-cleaning device known as the "Precipitron" was made available a few years ago. It charges small particles electrostatically, and then attracts them to a charged plate of the opposite polarity. High voltage electronic rectifying tubes are required for charging the particles as well as collecting them. This device has a cleaning efficiency of 90 per cent as compared to 25 per cent for the best mechanical filters. It is particularly effective in removing very small particles. For example, it will absolutely eliminate tobacco smoke and hay fever pollen. It is finding an increasingly wide usage in all types of applications where absolutely clean air is a requisite. It has just recently been installed in some machine shops to remove oil vapor suspended in the air.

The X-ray tube generates waves of a very high frequency, which penetrate solid matter. It has been used for several years in the medical field, but has recently been found to be of great industrial value in detecting internal flaws in material. By discovering such defective material before machine work has been performed on it, many valuable man hours of work are saved.

The present scarcity of tin has forced the tin plate manufacturers to apply the tin electrolytically instead of dipping it in a hot bath as before. This reduces the



WEAR-TESTED METALS STEP UP TODAY'S PRODUCTION

Old in experience and resourcefulness, Woodworth has charted new ways to speed war production and to cut inspection costs.

American war industries quickly found they could obtain new speed from the consistent accuracy of Woodworth precision gages, ground thread taps, form tools and other perishable production tools.

Wear-tested metals give Woodworth accuracy its extralong life. Every piece of metal used in Woodworth gages is tested for wear by the severest modern methods.

Consult our Engineering and Development Departments on problems involving gaging and production tools.

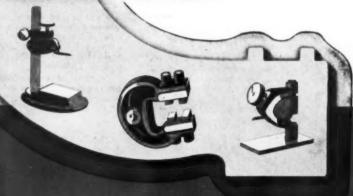
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N. A. Woodworth Co., Sales Division, 1300 E. Nine Mile Road, Detroit 20, Michigan PRECISION GAGES - GROUND THREAD TAPS - FORM TOOLS - PRECISION MACHINED PARTS - HEAT TREATING - PLATING

Precision

Chasing thread gage laps on a Monarch Sensitive Precision Toolmaker's Lathe, in a large precision gage plant.



Gages came first.

Before war production could start, precision gages to insure high precision and interchangeability of parts had to be made in undreamed-of quantities. A mere handful of gage manufacturers who had the "know-how" were given the job.

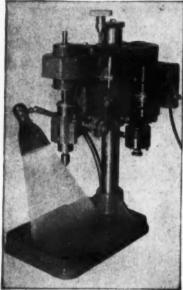
Monarch's assignment for 1941 was more than double any previous year's production of tool and gage maker's lathes. On November 11th, 1941, we were awarded the Navy "E" for more than fulfilling our assignment.

Precision gage making for war production is now well in hand. Soon, new precision gages for better peacetime production will be needed. The hundreds of Monarch lathes in the gage makers' plants still retain their in-built accuracy and will do as good a Peacetime job as they did a War job in the tool-rooms of America.

THE MONARCH MACHINE TOOL COMPANY . SIDNEY, OHIO

MONARCH LATHES
Save Time

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VICTORY IN SIGHT . .

Anything that strengthens the EYEpower of our manpower results in more production and fewer rejects. Workers on machine tools need best possible, on-thespot illumination for eye comfort, reduced fatigue and increased accuracy.

VIMCOLIGHT provides clear, glareless light . . . softly diffused . . . easy on the eyes. Quickly adjustable to illuminate hard-to-light operations. It cancels out the shadow menace. Standard equipment on many of America's best-known machine tools.

Write for circular,

Vimco Manufacturing Company 188 Chenange Street, Buffalo 13, N. Y. consumption of tin to about one-third of the previous amount required to cover the same surface. Unfortunately, the electrolytic process gives a dull rough surface. It has been found that a bright surface can then be obtained by melting the thin coating of tin with the heating of high frequency waves. For heating a 30" wide strip, traveling at 1.000 feet per minute, 1200 kw of power, at about one-half radio broadcasting frequency is required. This is equivalent to the power of 24 of the largest broadcasting stations. Installations now totaling approximately 3 times the power of all our regular broadcasting stations together are now in operation.

High frequency tubes can be used to produce internal heat, in an object, and are therefore able to dry out material from the inside-out, rather than the outside-in. The use of internal heat instead of external, gives great savings in time in drying thick sections of organic materials, curing of plywood, plastic materials, etc.

The Cathode ray oscillograph records the path of a beam of electrons. Its chief virtue is that a stream of electrons has no inertia, and therefore follows exactly the actuating forces.

The electron microscope gives magnifications not possible with the optical type.

Electronic amplifying tubes are used in a very sensitive balancing machine. Vibration impulses, down to 25 millionths of an inch, are magnified to a point where they can be located and corrected.

Many types of electronic devices have proven very valuable in the medical field. Prominent among these is the X-ray tube, which has already been mentioned. Another is the "Sterilamp" which generates waves in the ultra-violet range and destroys many bacteria and spores. The installation of this type of lamp in operating rooms, has been found highly effective in reducing infections. Still another medical application of electronic tubes is that of generating high frequency heat in the human body. This is of great therapeutic value.

There are many secret types of electronic devices giving essential aid in the prosecution of the war. The details on most of these applications will probably not be available to industry until after the war.





Ex-Cell-O has just

printed a new folder on

Unit-type and other

Way Machines. A

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asking. Send to Ex-

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31631.

Ex-Cell-O Unit-type Precision Boring Machines Bring Added Practical Features

Ex-Cell-O has developed standard boring units, each a complete machine in itself, yet by means of heavy flanges and bolts these units can be bolted singly or in multiples to a stationary center section, resulting in a multiple precision boring machine. Note these advantages:

It is still a precision boring machine. Bores may be finished in tenths of thousands as before, yet units may be mounted in multiples and at angles, all operating simultaneously toward the center section.

Recause all units may operate simultaneously, production is considerably increased on many parts.

The unit-type construction allows for salvage of all but the fixtures in case of part changes. It is possible and economical merely to remove and replace the entire center section. This means a flexible machine on which maximum production can be obtained while the machine is set up.

Each way or unit has two feeds and a dwell in forward and reverse direction, and each can be controlled individually or by a central control button in conjunction with all other units hooked into the electrical panel. It is completely automatic except for loading and unloading.

More than most semi-special machines, this Ex-Cell-O machine incorporates desirable features in flexibility and production, for war work today and peacetime products tomorrow.

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PRECISION THREAD GRINDING. BORING AND LAPPING MACHINES + SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES - SPECIAL MULTIPLE PRECISION DRILLING MACHINES BROACHES - GRINDING SPINDLES - HYDRAULIC POWER UNITS - DRILL IIIG BUSHINGS TOOL GRINDERS - CONTINENTAL CUTTING TOOLS - DIESEL FUEL INJECTION EQUIPMENT

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REVERSIBLE SHEAR, PUNCH AND PRESS No. 10

Expensive dies can be eliminated and readjusting of standard production machines avoided that use of this machine. It provides the necessary facilities in large production plants for completing patterns, jigs, templates, samples, etc.

It is also indispensable in job shops where sheet metal is fabricated, involving punching of holes or shearing of openings in any location to the center of 42", on sheets up to No. 12 gauge.

Many jobs can be entirely completed on a single No. 10 unit, which would otherwise require three separate machines—on operations such as stoves, ranges, signs, cornice and architectural work, store equipment, etc.

This sturdy 800-lb. machine will stand up in hard service and prove a profitable investment in any shop.

Write today for further details.

EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS These wartime uses have given considerable impetus to the development of electronic devices, and have served to uncover many new uses for them. From this it follows that their peacetime uses will be many in the post-war world.

Altho electronics is surging ahead, undoubtedly there will be mis-uses of it. Industry must be careful that these mis-uses do not discredit or delay the legitimate electronic applications, of which there are almost an infinite number.

(Pictures, courtesy Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.)

GIDDINGS AND LEWIS BROCHURE

An attractive, colorful, and well illustrated booklet entitled "Get Acquainted with Giddings & Lewis" has been issued by that company, which for 82 years has been doing business at 144 Doty St., Fond du Lac, Wis. This pamphlet contains the story of the company from the time it was established in 1859, as a small machine shop, to the present time. It is attractively illustrated with pictures of the plant and personnel. Numerous shop views are included together with many pictures of G & L products.



On a GORTON 16-A



GREATER ACCURACY . . . IMPROVED FINISH Reduced Grinding Down-Time Faster, Low Cost Setups

This manufacturer selected the Gorton 16-A Precision Automatic Screw Machine to obtain greater accuracy and improved finish in machining these cam follower pinions—each completed in see operation in 6 seconds!

Simple, single-point tools—easy to grind—brought savings in down time required for grinding the forming tool used in previous methods. Rigid construction of the Gorton 16-A-the heavists Swiss-Type Screw Machine built—enabled precision performance 21 hours daily on production runs of 30,000 parts. Gorton accuracy and Gorton finish eliminated subsequent operations.

Wide Range of Work

The Gorson 16-A produces an almost endless variety of short or long, slender parts — diameters .005" so 7/14", lengths 1/24" so 21/4"—complete in one operation.

It does step turning, generates curves, tapers, back recesses, knurls, chamiers, etc. It centers, drills, alots, threads or taps.

Tool slides are easily accessible. Micrometer adjustments for all sools insure accurate, quick setups at low cost. Centralized fangerigi controls provide infinitely variable spindle speeds (100 to 100 to 100 R.P.M.) and infinitely variable cam feeds (20 to 720 pieces per bour; 20 to 1460-optional). No speed or feed gears to change.

GORTON Complete Cam and Tool Service For Any Make Swiss-Type Screw Machine — Gerton or Others

For Any Maks Swis-Type Surew Machino—Gorton or Others Gornon exclusively officers, a complete cam and tool service. Highly skilled engineers are available to take care of all your needs. This service consists of a detailed cam and sool layout, listing all opera-tions of the machining cycle together with necessary cams, cools, collets and bushings. This service is available at the Gorton factory at Racine, Wis., for the Midwest and Pacific areas, and from Russell, Holberoth, and Henderson (ops Eastern Distributors) of New York City for quick service in the East.

Small Parts like this



TOOLING: 4 standard single-point cut-ters. 4 flat cams.

SEQUENCE OF OPERATIONS

1—Turn 30° taper 1/44" long and turn 2° to 3° taper 1/32" long to diameter of .0495" (±.0005"). 2-Advance headstock .205" and plunge cut for 3/44" diameter of .0495" (±.0005").

3-Turn taper 2° to 3° 1/32" long and turn 30° taper 1/44" long. 4-Cut off finished part.

MATERIALI 564" dia. S.A.E. No. 1060

PRODUCTION: 10 pieces

GEORGE GORTON MACHINE CO. 1317 Racine St., Racine, Wis. Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

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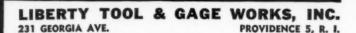
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When You Use Grinding

Here is a machine tool which will DOUBLE the potential capacity of your surface grinders.

Model No. 90-31

Set at 90°, grinding a gage seat in a hard-to-get-at place. Can be set to any angle within 180°.

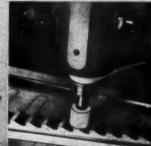


ONE Equals TWO

Liberty High Speed Attachments

LIBERTY HIGH SPEED GRIND-ING ATTACHMENTS are precision built for intricate and hard-to-get-at precision grinding jobs.

Model No. 90-31
Sharpening broach
with 5° clearance.



lodal No. 90-31

Grinding hardened flats and blind plats in re-



Model No. 90-31 Grinding hardened work seat ordinarily hard to get at.

WRITE FOR FURTHER INFORMATION

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PROVIDENCE 5, R. I.

GREENLEE	6-Spindle	AUTOMATICS

OPERATIONS	POS. NO. 1	POS. NO. 2		POS. NO. 4		NO. 6
Ferming	4	4	v	4	4	41
Form Turning	4	4	4	4	4	41
Shaving	4	4	V	4	4	4.5
Skilving	4	w/	4	4	W	41
Standing	4	4	4	¥	¥	41
Knurling	4	4	4	4	w/	41
Wide Form Knurring	4	4	Ą	4	*	41
Yasing	4	4	4	4	4	र १
Burnishing	*	4	W	4	4	41
Thread Holling	4	A.	¥	*	w.	4.5
Under Cutting			4	4		
*Cus-0#	4	4	4	4	4	¥
END-WORKING OPERATIONS						
Threading			4	4	4	4
Yopping			4	4	4	N/
Reaming			4	4	4	4
Drilling	Any	Pasi	ien	ncopt	Cut-	110
High-Speed Drilling	-	- 10		H	-11	N.
Boring	-	11		- 11	-M	
Eccentric Boring	10.	**		- 10	765	10
Facing	77	100	-8	R	- 10	14
Burnishing	-		**	H	16.	
Recessing	H	FA.	**		IN.	12.
Charriering	10.		9	ie.		**
Milling	- 10	4.0	16.	-		42
Rober Yurning		- 12		**	**	**

† Only when not used as cut-off position.

 Cat-off cannot be combined with another operation on the same cross slide. Position may be varied to produce two or more parts simultaneously. ■ With a minimum of down-time, hundreds of Greenlee 6-Spindle Automatics are today busy turning out millions of acrew machine parts for the United Nations. An important factor termed "flexible capacity" is largely responsible for their high efficiency on a wide range of jobs, large or small. The flexibility of the Greenlee Six, for instance, makes possible fast alterations in set-ups and quick changes in tooling adjustments. Its capacity handles a wide range of operations. This is a vital factor today in meeting the everchanging requirements of war...will be more important tomorrow in dealing with post-war economy.

The flexible capacity of the Greenlee 6 handles with ease all of the 23 operations shown at left at any of the spindle positions

indicated. Thus, the sequence of operations are more easily arranged and synchronized to provide a high rate of efficiency on a wide variety of jobs.

Write for more information—get complete details on the flexible capacity of Greenlee 6 Spindle Automatics.

GREENLEE BROS. & CO.





BUILDERS OF THE FAMOUS MULTI-STATION AUTOMATIC TRANSFER MACHINE FOR MASS PRODUCTION OF AIRCRAFT CYLINDER HEADS

GREENLEE



Automatic Screw Machines

PRESSES

for Post-War Work

DURING the war, forming of sheet metals has been the "big job" of metal aircraft builders and their many sub-contractors. It has been necessary for these manufacturers to augment their sheet metal forming equipment. In most cases, the self-contained hydraulic press has been one of the basic lines of machinery installed.

In less than one minute, the airplane upper tank section illustrated in Fig 2 is drawn from a flat blank to the required shape. An H-P-M Fastraverse deep sheet metal drawing press is employed. Previous to installation of the hydraulic press, such parts were formed with drop hammers, at a rate of one tank section every two hours. Many times it was necessary to fabricate the sections from numerous smaller formed parts. Now the

tank section is produced in a single press stroke. The hydraulic press is a selfcontained type, equipped with hydraulic blankholder and die cushion. A matched punch and die set is used. A ring carried by blankholder slide holds blank while part is drawn.

The same type of press, only smaller in size, can be used effectively for deep drawing smaller sheet metal parts. A typical small blankholder press is illustrated in Fig. 3.

A main advantage of the blankholder deep metal drawing press is that parts can be turned out rapidly, without wrinkling or tearing the sheet metal during the drawing operation.

The aircraft industry has been quick to adopt hydraulic self-contained deep metal drawing presses. Altho such press-



Fig. 1-A modern sheet metal "stretcher" which is being much used by the aircraft industries in forming airplane "skin" parts.



Fig. 2—Deep sheet metal drawing press which forms airplane upper tank sections in less than a minute. Previously such parts were formed with drop hammers at the rate of one tank section every two hours.

es were used previously to manufacture automobile parts, household appliances, etc., there has been no acceptance equal to that of the metal aircraft builders.

It is logical to assume when peacetime production is again underway, that the blankholder deep metal drawing press will find wide use in all sheet metal forming, embossing and drawing fields. The type of sheet metal to be drawn is of little consequence, as the hydraulic blankholder press will handle all types with equal efficiency.

The H-P-M deep metal drawing press with blankholder and die cushion is rather unique in its operation. Three different hydraulic ram movements are used, viz. main slide, blankholder slide and die cushion platen. A typical die set-up is illustrated in Fig. 4.

Blankholder slide is located below main slide. Blankholder ring is mounted directly on face of blankholder slide. Accurate alignment of blankholder ring is assured, as it is rigidly supported over the broad flat surface on face of gib-guided blankholder slide. Holding pressure of each blankholder ram is regulated to allow metal to follow contours of draw punch as punch travels thru center opening in blankholder slide and on into die ring. This permits draw to be made without wrinkling or tearing.

As the drawing proceeds, bottom of piece is gripped between punch and die bottom, the latter being forced downward against a yielding resistance. In some cases the die cushion is used only as an ejector.



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- Uses Minimum Floor
 Space
- Conveniently Located
- High Speed Fast Production

Easy to set up

Note the simple arrangement above, using a regular lathe and two Jones Backstands, Bulletin No. 120 gives complete details.

JONES ENGINEERING COMPANY

DEPT. B-3
ELLWOOD CITY. PENNSYLVANIA

A single radial pump generates hydraulic pressure for all press actions. Oil trapped in blankholder and die cushion cylinders is intensified by the downward acting movement of punch-carrying slide. These intensified pressures produce resistance forces necessary for holding blank and cushioning draw. Each force is regulated at operator's control station.



Fig. 3—A smaller size blankholder press which should be useful for post-war deep metal drawing.

For shallow forming and flanging operations, the self-contained hydraulic press equipped with rubber pad has found universal acceptance in the aircraft industry. Fig. 5 illustrates a 2500-ton H-P-M Fastraverse rubber pad forming press.

A rubber pad mounted to moving press platen, forms the metal sheet around dies. By this means, construction of positive female dies is avoided, as the rubber pad takes their place. Several dies can be used at one time, in the same press. Die tables, one at each of the four press sides, are operated successively and in rotation; three in the process of loading and unloading, while the fourth is in the press. Normally aluminum alloy sheet is formed by the rubber pad process.



TODAY this highly accurate and dependable surface grinding machine is serving the production needs in many war plants.

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ABRASIVE MACHINE TOOL COMPANY

DEALERS IN PRINCIPAL CITIES
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Soud for Descriptive Bulletins ABRASIUE RODUCTION

February, 1944

MACHINE TOOL BLUE BOOK

151



OLIVER DIE MAKING MACHINES

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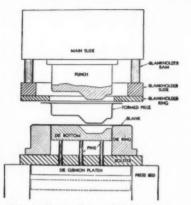


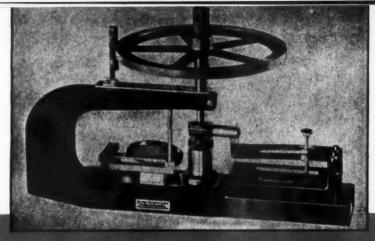
Fig. 4-Sketch of a typical die set-up.

altho it is possible to form sheet steel parts in a similar manner. The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, pioneered in rubber pad forming.

With the possibility of more and more light gauge aluminum alloy sheet being



Fig. 5—A 2500-ton rubber pad forming press which will help cut die cost in postwar production.



R SUSTAINED ACC

New System of Accuracy—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from warn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workman-ship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service,

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The Van Keuren Light Wave Micrometer is described in full in our manual of precision measuring equipment. This book also gives complete tables and simplified formulae for measuring all standard threads, splines and spur gears, Write for your copy!





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AMERICAN PHOTOCOPY EQUIPMENT CO.

2849 N. Glark St., Dept. G-24, Chicago 14, 111. Representatives in principal cities and Canada used after the war, it is quite natural to expect that the rubber pad forming press will be used to advantage, especially to keep consumer prices as low as possible. One of the big factors in the price of pre-war articles was the high cost of dies. This problem has been eliminated by the hydraulic rubber pad forming press.

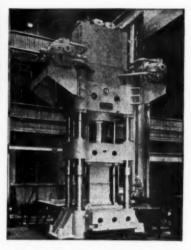


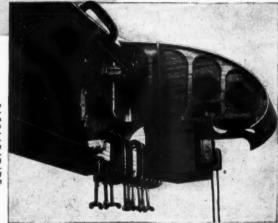
Fig. 6—A massive forging press for flat die forging, working down hot billets between the anvil blocks.

Another type of sheet metal forming which has become quite popular is sheet metal stretching. Fig. 1 illustrates a modern sheet metal stretcher built by The Hydraulic Press Mfg. Co.

The aircraft builder is again the user of this new sheet metal forming machine; airplane "skin" parts being the largest production runs. The metal blank is gripped in opposing jaws. As the jaws move apart, the die carrier platen moves upward, and the metal sheet is formed or stretched to shape of die. Inexpensive dies of wood or "Kirksite" are normally used. By employing special fixtures, extruded shapes also can be formed. The

The Choice of Leading Aircraft Builders....

HARGRAVE Super Clamps in use at Beech Aircraft Corporation. Photo shows Clamps applying heavy pressure to a glue joint on wood center section of the plywood BEECH-CRAFT AI-10 Advanced Pilot Trainer. This was an experimental set-up, later adapted for production purposes. Heartray lamps (in box at right of Clamps) accelerate glue-joint drying.

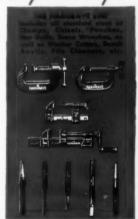


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THE CINCINNATI TOOL CO.

stretching machine should find wide acceptance in post war production, especially for manufacturing parts for aircraft, buses, funeral cars, automobiles, etc. A typical example of post-war production would be forming steel turret tops for automobiles. Altho the hydraulic stretching press requires more stock per formed part, the savings in die costs and large press equipment minimizes this point. Even reverse draws can be performed, by employing an overhead structure, which will permit mounting male dies above stretching die.

To deviate from sheet metal drawing, there is another revolutionary H. P. M. hydraulic press development — the selfcontained "all hydraulic" forging press.

Prior to the new self-contained hydraulic press with its electric motor and hydraulic pump integrally mounted, forgings were made with hammers, mechanical presses, and accumulator-operated hydraulic presses. Main advantages claimed for the self-contained "all hydraulic" forging press are—(1) lower first cost, (2) cheaper operating cost, (3) less maintenance. Presses are built for both flat die and closed die forging of magnesium, aluminum and steel.

Fig. 6 illustrates a forging press for flat die forging. Such a press is used to work down hot billets between anvil blocks. The lower anvil block is stationary, being fastened to the press bed. The upper anvil block is mounted to the moving press platen. The press is operated with short, rapid strokes, the upper anvil block contacting and pressing the hot billet on each stroke. After billet has been forged to approximate shape, it is ready to be machined to exact dimensions.

Fig. 7 illustrates a closed die forging press. This particular H-P-M press is of 2000-tons capacity. Several presses of this size were built to forge aluminum cylinder heads for radial aircraft engines.

Undoubtedly the "all hydraulic" forging press will play an important part in the post-war forging industry.

The hydraulic press is also pioneering other metal working applications which will prove beneficial for post-war production. Prominent among these presses are those used to form parts from powered metals; others include metal die casting machines for magnesium and aluminum.



Fig. 7-A 2000-ton closed die forging press.

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This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.

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selves become critical.

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WO. 7195-R

MACWHYTE SLINGS FOR INDUSTRY Lifting safety to new heights"

The Collet that "Makes"



Collapses 1/32 in. — Retains Gripping Strength and Accuracy,

Collet upon at both ends.

PRINCIPLE

The drawing (right) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

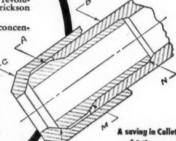
Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

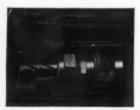
Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.



One ERICKSON COLLET will replace 7 standard, single purpose Collets.



A saving in Callet expense of 6 times—or more,



Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.



Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.



Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

Send for Bulletin E giving complete information and additional photographs of uses

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7he ERICKSON COLLET CHUCK**

Model "01" occurate within .0005 or less at the ness.



Models 102 and 402 Chucks in use on Automatic Screw Machine.

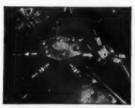


Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.



Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.

Model "02" accurate within ,001 or less at the nose.



Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



Model 301 Chuck designed for high speed internal grinding operations.



Tool Post Grinder equipped with Model 301 Chuck.

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This manufacturer bores both wrist pin and main bearings in connecting rods simultaneously on a No. 2U Stokerunit Simplex 2-Way 4-Spindle Precision Boring Machine. The two ends of the machine alternate in the roughing and finishing op-

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ECOND SPINDLE—Finish boring wrist pin end of rod in steel forging (230 Brinell); stock removal 010". Bore is .875" dia. by 1" long.

At this point, one operator removes rod and presses in bronze bushing, while other operator oads machine for initial operations,

THIRD SPINDLE — Finish boring babbitt bearing; tock removal .005". Bore is 1.752" dia. by 11/2" ong. Also facing and chamfering other side of bearing.

OURTH SPINDLE—Finish boring bronze bushing on wrist pin end of rod; stock removal .004". Bore is .750" dia. by 1" long.

One operator now removes completed rod and oads other end of machine for final operations.

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ACTUAL BORING TIME EACH
32 SECONDS COMPLETE

(Right) The two ends alternate in boring cycle, each end boring wrist pin and main bearing at same time.

(Below) Two
operators
maintain production of 70
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rods per hour.



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Tooling for Flying Fortresses

By FRANK V. FAULHABER

UNDER pressure of the current emergency, machine shops have had to devise more and better tools to expedite production. Plants relying too much on equipment of the past have been out-distanced by more progressive and more enterprising managements. In the fore-front belongs Boeing Aircraft Co., of Seattle, whose Flying Fortresses have been coming off production lines with consistent regularity.

That Boeing has been able to accomplish so much during such a time, has been due in no small measure to performance of the tooling department.

Many thousands of new and special tools of all sorts and classifications have permitted the constantly increasing production schedules.

Numerically, 100,000 separate tooling units might seem to take in a wide range of tools. Nevertheless, this figure does not include standard types of tools pur-

chased, such as electric motors, drilling motors, pneumatic hammers, riveting machines, die sets, large presses, dies, machines and innumerable other tools required in manufacturing the Boeing B-17F. The number probably would be doubled were these also included.

The Boeing plant makes high wing jigs about three-stories high, which constitute the largest of its tools. More wondrous than the size of the jigs, however, are the facts that these jigs contain ample working room for large groups of workers on each floor or story, with light aplenty and ventilation enough to permit comfortable working. Noteworthy is the fact that these jigs can be partially dismantled to remove the completed wings, and reset within a very brief time. Also, adjustments on the jigs enable Boeing inspectors to check the accuracy of the jigs to limits of 5/10,000ths of an inch, or, roughly, about 1/10th the thickness of a human hair.

Genieve Stahl, Boeing Aircraft employee handles a precision machining job with the aid of a newly developed fixture.





At the other extreme, grommets represent the smallest of the Boeing tools. These items are used to hold together the longitudinal and circumferential stiffeners of the Flying Fortress fuselages while

riveting is started. In form, these grommets resemble the metal eyelets used in shoes to provide reinforcements for lacings. The only difference is that the Flying Fortress grommets, made of aluminum, are considerably smaller. Thousands could be taken up in one handful.

It was not a recent experiment of the Boeing plant to make special tools. In deed, it has been a long time since this company's tooling engineers developed the method of accurately corrugating Dural, frequently used in plane production. Thruout the aircraft and aluminum manufacturing industry, this company's unique method of corrugating this material is now being used.

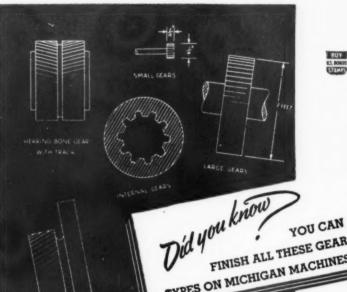
The company's executives have always tried to be a step in advance. Now Boeing's tooling department is diligently occupied in developing ways and means of speeding up ever increasing Flying Fortress production. Progress of a notable job at its plant is already evident. This organization's "Octopus", a circumferential hydropunch, performs 19 different punching operations, simultaneously, making "V" type slots in the circumferential stiffeners-(the metal ribs that encircle the fuselages of the Flying Fortresses). This machine turns out the work 45 times as rapidly as the unit which it has replaced. Douglas Aircraft and the

(Upper Left) Among the many tools made by Boeing are gages for checking jigs on which the various parts are built. Here, tool fabrication men check a master control gage.

(Right) Vertical planers such as this, hurry production of dies for fabrication of Flying Fortress parts. Constant improvement of dies is an important part of the Boeing tooling program, often making one large die perform the work formerly done by several



162



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MICHIGAN TOOL COMPANY

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Vega Aircraft Corporations are now using identical machines.

Also of note is the automatic aluminum spot welding table, another of Boeing's tooling developments. Those who have worked with aluminum know that it is a tricky metal to weld. It must be thoroly clean. The barest finger-print on the surface may cause an imperfect weld. This operating unit makes big sheets of aluminum from small ones. Other aircraft manufacturers have thought so much of its efficiency that similar equipment is being used to expedite production.

And here is something else of special interest to machine shop managements. The tooling department at Boeing's plant is so organized that often they can start a new die in operation, manufacturing parts within two weeks of receipt of a change request. For instance, about 50 per cent of the time, or one week, is required for the designing of the die: the other week for making it, Compared to the automotive industry's two to six months required in making some of the big dies, this is a marked advancement, In lieu of hard die steel, as used by the motor industry, the Boeing plant uses a special metal which can be melted in Boeing's foundry, and cast.

Initially, a plaster and wood "mockup" of the die is made, to shrink scale-(\(\frac{1}{2} \)"



to the foot). A plaster mold is made from the mockup. The mold is covered with lacquer. A plaster pattern then is made from the mold. Next the pattern is sent to the foundry and the die is cast.



(Upper Right) Gustave Johnson (top) and Helge Kristrom guide a vertical fin as it is lowered onto a Boeing B-17 Flying Fortress fuselage.

(Left) By means of this ingenious wheel handling dolly, a quarter-ton landing wheel can be installed with no more effort than putting on a bicycle wheel. Wm. Smith is pushing the wheel onto the axle of a Flying Fortress in final assembly.



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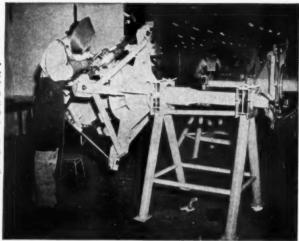


PUTNAM TOOL COMPANY

2983 Charlevoix Ave.

Detroit 7, Michigan

Arc Welding Boeing B-17 Flying Fortress motor mount parts with a welding jig that holds parts in place and permits rotation as required. Man behind mask in foreground is Darrel Heck with Oscar Tydberg in background.



After it is cool, the die requires a little polishing to remove the rough marks of the sand. It is ready for use after a preliminary check-up for accuracy. Of pronounced import, especially to the aircraft industry, for which this die process is particularly adapted, is the fact that it is seldom necessary to make more than five or ten thousand parts from a single die.

The advantages of this Boeing procedure is indicated by the tail gunner's door. As originally built, the door to the rear gunner's compartment of the Flying Fortress required a jig, and more than 30 separate parts, which were assembled by riveting and spot welding. Contrarily. when a die for a draw and form operation was made for this particular job. 26 parts were eliminated, in addition to numerous rivets, and, of greater import, a considerable saving in time was effected, because there was no door to assemble.

The rear gunner's door change or innovation was just another Boeing design change. From time to time this plant institutes such changes, whenever the management is convinced that a substantial saving of time and energy is possible in the manufacturing processes. Various design changes are requested by Army officials, who as operators of the planes, desire additions to some ships,



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Points for Various Operations





providing better protection, or calculated to make the Flying Fortress more potent fighting units. Whenever such changes are undertaken, a preliminary step involves construction of such dies or tools as may be necessary for the job. First the tooling designers develop the new items on blue prints. Then come the tooling fabricators, who work in conjunction with the designers to bring out the desired units or tools.

Another point to be observed is the flexibility of Boeing's tooling department. To particularize, production of aircraft according to schedule at this company's plant, was carried out during the changeover from one model to another, altho the latest model involved more than 400 individual design changes. Immediately tools were made and prepared for production when time for manufacture of the new ship was at hand. Additionally, the tooling department can predetermine the exact plane on which a contemplated change will first appear, enabling the production section to start operations accordingly.

Of significance is the fact that parts made on draw and form dies from Dural or Alclad require vastly different procedures than entailed when working with steel. For illustration, in the automotive industry it is possible to change the thickness of the steel, or to use metal of a different analysis when the die does not function correctly. In aircraft manufacturing, involving maximum strength with a minimum of weight, it is necessary that a certain thickness or gauge of metal be used. Moreover, the material is always the same, Dural. This metal does not flow in a form and draw die, as is the case with many kinds of steel. In processing steel, heating may be done with a torch, as followed in some press operations. Not so with Dural, inasmuch as the aluminum compound would lose its strength. As may be imagined, there necessarily were many kinks and problems to be mastered in striving to utilize draw and form dies in aircraft manufacturing. In this field, naturally, the Boeing plant did plenty of pioneering.

(Approved for publication by the Bureau of Public Relations, War Department, Washington.)
(Photos-Courtesy Boeing Aircraft Co.)



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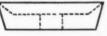
Shearcut Milling Cutters usually leave no tool marks. They may be rotated in either direction, generate less cutting heat and so save power and time, do not weld, take very heavy cuts with extreme ease . . . quickly pay their cost.

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THE FOREMANSHIP FORUM By Edmund Mottershead

PART XVII. — WAGE AND SALARY STABILIZATION

Herbert Burstein, A. B., LL. B., J.S.D., member of the New York Bar, is a specialist in administrative law and acts as expert consultant to various trade associations. He has contributed this discussion to the forum and hopes it will be interesting and helpful. (The Editor)

FOR the duration of the war and, perhaps, in the post-war period, industrial labor relations will be governed by current wage and salary regulatory measures. Stabilization is probably the most important single factor in the manpower problem. It is, in a real sense, the key to employee retention. And retention, rather than recruitment, will be the major task of the war industries for the balance of the war.

It is reasonably certain that the labor market cannot, in the absence of a National Service Act or a compulsory draft of women, be expanded beyond its present high level. Production schedules must suffer if large numbers of skilled and semi-skilled men are drafted into the armed forces-as they are likely to be. Hence, it is important that each plant retain a considerable nucleus of skilled employees and to devise methods for reducing labor turnover. Even if the War Manpower Commission rules "froze" workers in their present jobs (and they do not), every shop foreman knows that a toolmaker or layout man or a machinist who wants to quit becomes a liability. With cost-plus-fixed fee contracts rapidly being replaced by so-called "incentive" contracts, maintaining high productive efficiency becomes a matter of signal importance.

Every machine tool manufacturer faces a two-fold problem of retaining a skilled working force and providing adequate work incentives. To these problems, wage and salary stabilization may suggest the solution.

The oldest and still the most effective incentive is a "raise". But pay increases cannot be granted indiscriminately, as employers well know. Nevertheless, wage adjustments may be made, employees can be upgraded or promoted, reclassification is still available to employers. How, then, does one proceed to increase the pay of a machinist, third grade? How is a tool maker. Grade B. promoted to grade A: how may a diligent and deserving employee be rewarded for improved quality and quantity of work? These are the questions which confront every personnel manager and the answers can be found only in stabilization rules and regulations,

Too many companies, pressed by employees have granted questionable, if not clearly illegal increases which have brought wage levels far beyond rates prevailing on October 3rd 1942 or, where rates are fixed by labor agreements, above union scales. Where a union contract was in existence on October 3, 1942, and increases were illegally made thereafter, employers will face two extremely serious problems:- (1) how to explain the increases so as to avoid the severe penalties prescribed in stabilization rules and (2) how to meet the demands of unions for wage increases. For example, where a union contract called for a wage of \$1.20 an hour and the employer, because of pressure from employees, raised



UNIVERSAL ENGINEERING FRANKENMUTH, MICHIGAN wages up to \$1.45 an hour, it is more than certain that the union will, in negotiating a new contract, demand a scale beyond the prevailing \$1.45. Assuming that a contract calling for \$1.50 cents an hour is approved by the War Labor Board (and this is extremely doubtful), illegal increases previously made are not automatically regularized.

Aside from the fact that a proper system of making increases by upgrading and promoting employees is important from the standpoint of employee retention, it is probably one of the most effective ways of promoting good employee morale. Petty intra-plant jealousies, which arise when certain employees receive increases while others do not, can be avoided when a systematic plan is adopted and the plan is understood by employees.

Wage and salary stabilization has reached the point where it is by now fairly well settled and, altho complex, provides workable procedures. The purpose of this article is to summarize the fundamental rules which guide the War Labor Board and the Treasury Department in the application in the Anti-Inflation Law.

The first thing a personnel department needs to do is to review payroll practices since January 1, 1941 and to compare these with the rules. Intelligent application of the rules will make for sound employer-employees relations.

Wage stabilization begins with the enactment of the Second Emergency Price Act in October 2, 1942. The Act authorized the President to stabilize wages, salaries and prices on the basis of levels existing on September 15, 1942. The Act does not freeze wages or salaries; it merely regulates and systemizes methods of making increases or decreases in pay. Under the law, the President was given power to prescribe the necessary regulations. Thereafter, by executive order No. 9250, the President established the Office of Economic Stabilization (O.E.S.) and delegated authority to the Director to formulate and develop a wage and salary stabilization policy. Subsequently, the Director of the O. E. S. issued directives which established the authority of the National War Labor Board over all wage payments and certain salary payments and the authority of the Commissioner of Internal Revenue over cer-



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tain salaries. The directive also prescribed that no decreases could be made in wages or salaries below the highest level paid between January 1, 1942 and September 15, 1942 except: (a) to correct inequities or to promote the effective prosecution of the war and (b) salaries of \$5,000 or more a year could be reduced to a rate not less than \$5,000 a year without approval. So far as salary increases are concerned. the directive prescribed the basis for all increases. At the outset, there were five recognized bases for increases: (a) to correct a maladjustment: (b) to eliminate substandards; (c) to correct gross inequities: (d) to correct gross inequalities and (e) to promote the effective prosecution of the war.

The N. W. L. B. was given jurisdiction over (1) all wage payments; (2) all salary payments up to, but not more than \$5,000 a year paid to all employees and; (3) salaries up to \$5,000 a year paid to executive, administrative and professional employees who are represented by a duly recognized or certified labor organization.

The Commissioner of Internal Revenue has control over (1) all salaries in excess of \$5,000 a year and; (2) salaries up to \$5,000 a year paid to executive, administrative and professional employees not represented by a labor organization.

Both agencies issue separate and distinct regulations. Originally, their rules were loosely drawn and employers made a practice of granting across-the-board increases whenever pressure for wage adjustments was exerted. The result was that the President issued, on April 8, 1943, the "hold-the-line order" (Executive Order No. 9328) which permitted increases only:—(1) to correct substandards and (2) to correct maladjustments. Inequities and inequalities were eliminated as grounds for upward adjustments. Then, applications for wage and salary increases piled up at the regional offices of the WLB and it seemed likely that the Board would have to go out of business unless a portion of its former powers were restored. Eventually, the Director did restore inequities as a basis for wage and salary increases.

Currently, both NWLB and the Commissioner of Internal Revenue may ap-

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prove increases above those prevailing on September 15, 1942 if:- (a) the increases are necessary to correct sub-standards of living; (b) the increases are limited to adjustments made in accordance with the "Little Steel" formula; i.e., to correct a maladjustment (c) the increases are necessary to adjust salaries or wages up to the minimum of the tested and going rates paid for the same work in the same or most nearly comparable plants or establishments in the same labor market; (d) reasonable adjustments in case of promotions, reclassifications, merit increases, incentive wages or the like provided there is no appreciable increase in the levels of production costs and will not be the basis of an increase in prices or to resist otherwise justifiable reductions in prices.

WHO IS COVERED

All salaries and all wages paid in the U. S. are covered whether the business is local, intrastate, or interstate. The sole exemption applies to employers of eight or less employees in a single business. However, the Board is authorized to withdraw the exemption for employers of eight or less where indiscriminate pay increases have unstabilizing effect and where the employer is party to a master contract. Furthermore, employers of eight or less are required to keep records of pay adjustments.

Exempt employers may, obviously, make increases without obtaining approval.

There are, also certain increases which may be made without approval even where the employer is covered by the Act and these are (1) increases up to 40c an hour: (2) increases to equalize the wage rates of women with those of men for comparable work, but the NWLB must be given notice of such increase; (3) increases required by State and/or Federal wage laws; (4) all increases in wage rates which were put into effect on or before October 3, 1942, Such approval includes increases first reflected in a payroll subsequent to October 3, 1942, if applicable to work done, and provided for by written agreement, or formerly determined and communicated to the employees, on or before that date: (5) increases by an employer of 30 or less employees in a single business within cer-



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tain prescribed limits: (6) increases by employers of more than 31 employees where a schedule of wage or salary rates or rate ranges are properly in existence and the increases are made pursuant to a plan. With reference to increases made by employers of 30 or less employees, only two types of increases may be made, (assuming that there is no schedule properly in existence):-merit and length of service. It is also important to remember the words-"single business" because where a single company operates two plants employing 15 in one and 16 in another, it will be regarded as employing more than 30 employees. In the case of employers of 31 or more employees, increases may be made only for (a) individual promotions or reclassifications (b) individual merit increases within an esstablished wage or salary rate ranges (c) operation of established plan of increases based on length of service (d) increased productivity under incentive plans and (e) operation of a trainee or apprentice system.

INCREASES REQUIRING APPROVAL

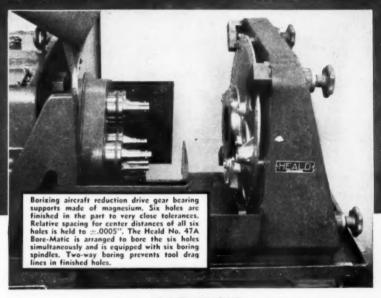
If an employer is not exempt and is not eligible to make any of the permissible increases for all of the employees, then all increases must be approved. NWLB (and to a certain extent the Treasury Department) will approve increases only:- (1) to correct a maladjustment; (2) to correct substandards; (3) to correct inequities within and between plants; (4) to correct obsolete wage structures and to contribute to the effective prosecution of the war. No increase which requires approval may be approved unless it comes within one of the four named standards. It is impossible in the brief space allotted here to competely discuss each of the standards. The basic principles however will be indicated.

MALADJUSTMENTS

Increases are permitted by the Board under the "Little Steel" formula. The Government determined that between January 1, 1941 and May 1942 the cost of living increased by 15%. Accordingly, the NWLB may approve increases in straight time hourly wage rates up to 15% above the straight time rates paid to a group of workers on January 1, 1941.

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Instrument End Shields Magnete
Housings
Oil Pump
Bodies
Propeller Shaft
Plugs
Reduction Gear
Cases
Regulator
Housings
Speed Reducer
Housings

Supercharger Gear Casings Valve Housings Valve Tapper Guides If increases totalling 15% have already been granted to the group of employees to compensate for the increased cost of living, no further maladjustment increase may be granted. The NWLB may refuse to grant the full 15% or even any part of it where wage rates are already so high that further increases have an unstabilizing effect. From the maximum allowable, 15%, all general increases to employees must be deducted. But general increases do not include increases for merit, promotions, upgrading, reclassification, etc.

SUBSTANDARDS

There is no hard and fast definition of standards of living. Each case must be considered on its merits. There is, however, a general policy which the NWLB has adopted, under which regional boards are authorized to approve general wage increases up to 50c an hour to correct substandards of living provided the employer states:— (a) that he will not use the approval as a basis for seeking price relief or (b) to resist justifiable decreases

in price ceilings. Of course, increases up to 40c an hour can be made without approval.

INEQUITIES

An inequity is an unusual or unreasonable disparity between the rates paid for inter-related job classifications within one plant, or related jobs in other plants in the same or related labor market. In other words, if the difference in rates for jobs of comparable skill are grossly unfair, an inequity exists. But an increase to narrow the gap needs to be approved. The NWLB regional offices have set up brackets of sound and tested wage and salary rates (wage brackets) as a guide to prevailing rates for specific job classifications and uses these to correct inequities between plants. Upon application and after approval, rates may be increased up to the minimum of the rate range and in exceptional circumstances, beyond the minimum. But approval is required. No automatic increase minimum may be made.

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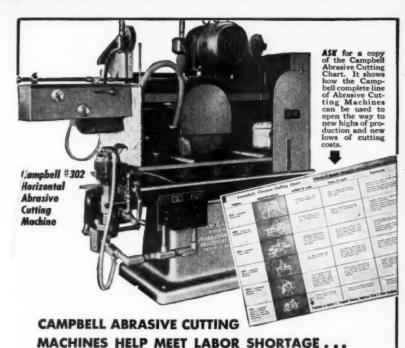
OBSOLETE WAGE STRUCTURE

There is no precise definition of this term. Here is an example of an increase granted on this basis:—A plant is doing vital war work and is located in an out-of-the-way place, to which workers find it difficult to travel and experience unusual inconvenience. An increase may be granted to promote the production of vital materials, i.e., to promote the effective prosecution of the war.

By and large, few employers can qualify under the standards. Most employers have granted the 15% cost of living increases. Few employers are paying substandard wages. Most employers are paying above the minimum of the sound and tested going wage rates, and increases to correct obsolete wage structures are rarely granted. Is an employer therefore barred from making increases? The question answers itself if one remembers that stabilization does not freeze wages and salaries; it systemizes and controls increases.

Generally speaking, employers will be guided by the requirements of General Order No. 31. This General Order is divided into two parts. The first part deals with employers of 30 or less. It prescribes that such an employer may make increases for merit and length of service without a schedule of job classification wage or salary rates or ranges, or a plan for making increases. But the order limits the total of such increases to any individual employee to a maximum of 10c per straight time hour during any year (beginning July 1, 1943) with the further proviso that the total amount spent on increases during any year must not exceed an average of 5c per straight time hour for all employees. Furthermore, the increases may not result in payment to any employee of a rate higher than the highest rate paid (July 1, 1942 and June 30, 1943) for jobs of similar skills, duties and responsibilities.

The rules applicable to employers of 31 or more employees are somewhat more complex. Such employers may make non-exempt increases without approval only under a schedule which includes job classification wage or salary rates or rate ranges and a plan for making individual adjustments within and between the rates or ranges. A job classification is a category of jobs or positions which are simi-



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lar in nature, content, knowledge, skill and experience. A rate exists where an employer pays a single rate for a given job classification. A rate range exists where an employer pays a number of rates varying from a clearly designated minimum to a clearly designated maximum.

If iob classification rates or rate ranges were in existence prior to October 3, 1942 or resulted from permitted or approved adjustments subsequent to that date, or from rates for new jobs under the former and revised General Order No. 6. the schedule would be deemed to be "properly in existence" and does not require approval of the NWLB. Similarly, a plan "properly in existence" does not require approval. However, if the schedule and the plan are not properly in existence, then job classification rates or rate ranges must be submitted for approval to the Board. With respect to the plan, the employer may submit his own plan for merit, length of service, promotions, etc., increases or adopt the Board's plan. It is extremely unlikely that the Board will accept a new plan which varies considerably from its own. However, this should be observed:-if the employer's plan is properly in existence, it may be continued without approval and there is no requirement to adopt the Board's plan.

Since, for the most part, employers will follow the standard plan, this brief summary is provided:

MERIT AND LENGTH OF SERVICE INCREASES

These increases may be made only within job classification rate ranges. The











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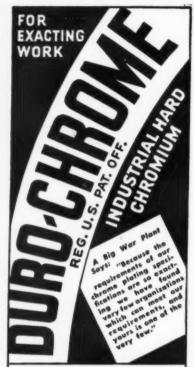
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in nature that a separate article would be required. Briefly, the NWLB permits the payment of fixed sum bonuses in the same amount in the current year as was paid in the bonus year preceding October 3, 1942 and where bonuses are computed on a percentage, a higher amount may be paid so long as the rate and method of computation are not changed. The Treasury Department rules are complex and employers are advised to obtain advisory rulings from the Salary Stabilization Unit when in doubt.

Penalties for violation of the wage and salary stabilization are severe. For willful violation, an employer and employee may be fined up to \$1,000 or imprisonment up to one year (or both.) Moreover, where an illegal adjustment is made, the Treasury Department may disallow, as a tax deduction, the full amount of the salary (including the illegal adjustment) from the employer's tax return.

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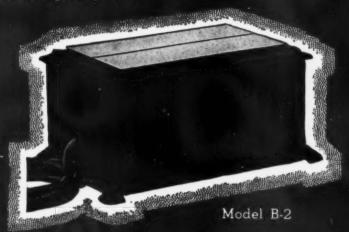
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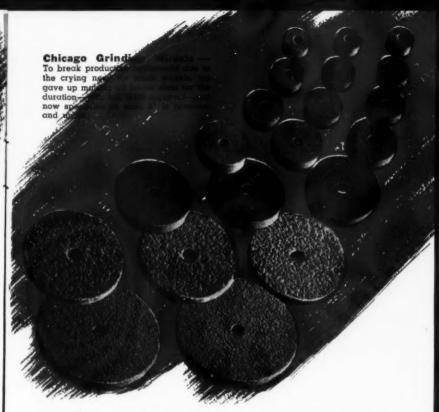
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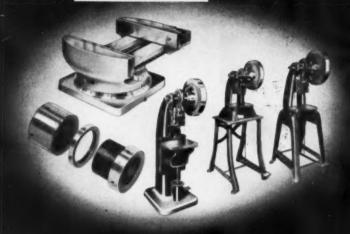
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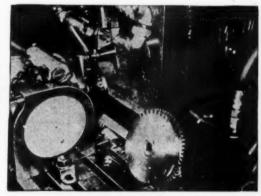
Aspects of Modern Milling

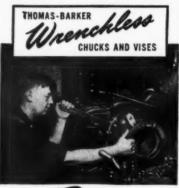
By JOHN E. HYLER

HERE are some types of plain horizontal millers which at first glance might not be regarded with favor. However, after reflection, one realizes that they were specifically designed to fill a given niche in industry. For instance, in the taking of heavy cuts, on a production basis, the idea of a handfeed milling machine for the purpose is not calculated to arouse enthusiasm. But for heavy-duty jobs of the kind, where but one or two pieces are to be machined, such a machine is really more handy than any other, if it can be depended upon for accuracy. It draws troublesome jobs away from heavy milling machines, leaving them free for real production work. Such handfeed machines are made for heavyduty, precision work, with tables about 42" long, allowing the machining of a 30" cut. They will handle the average run of milling work, and will even take care of some jobs that cannot be performed on other machines of this size.

When one thinks of high-precision and complicated cam layouts as applied to automatic machining practices, he usually thinks in terms of the automatic screw machine. Yet it is a fact that there are horizontal milling machines of bed type. made chiefly for light types of work, that exemplify the advantages of cam operation in this field also. Synchronization of cam actions is involved here just the same as in screw machine practice. Such milling machines are available in which the table travel may be given a fast approach, a travel thru the cut at the most appropriate pre-determined speed, and a fast return. An automatic table cycle thus controlled, enables an operator to care for a battery of machines. But in addition to this, a rising and falling action on the spindle head may be arranged by cam also, and synchronized with the cam action on the horizontal table travel. for two-level milling, or for the making of angle cuts, contour cuts etc. Special

Fig. 1—An interesting setup for radii milling on special cam gears. Work piece was held in a dividing head and turned by hand against the end mill cutter. Kearney & Trecker photo).





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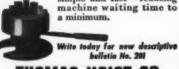
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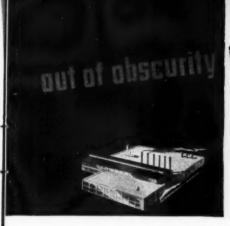
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hinged fixtures have also been used on these machines, and these, in combination with cam-operated feeds, mill intricate contours with accuracy and smoothness, and at high speeds.

Have you ever had occasion to use what is termed a universal milling head or attachment, which in effect transforms a plain horizontal milling machine into a machine of vertical milling type? A universal head of this kind, as built by some firms, allows the versatility of such a machine to be increased almost unbelievably. It carries its own motor of 1/3 hp. It is reversible as to its rotation so that it can use either right or left hand cutters, and may be had in either five- or ten-speed models. The cutter can be given a 4" vertical travel, and many milling, drilling, boring and facing operations can be accomplished in one setup. It incorporates a sleeve that slips over the horizontal milling machine round overarm, and is much used in the production of various tools, jigs, patterns, dies and like work. It operates from a plug-in cord and switch.

Where heavy work is handled more or less continually at a given milling machine, it is very naturally a matter of importance to make arrangements for handling the work onto the milling machine table and off again, without expenditure of too much effort. Various mechanical aids are available, but one of the best I have seen uses a simple chain hoist suspended from a trolley running on a monorail system. Especially in shops that have monorail systems for handling materials in general, it is a simple matter to provide a spur track to run out over the table of such a milling machine. The setting of heavy die blocks and other hardto-handle work on the milling machine table with such an aid reduces drudgery and speeds production.

Universal milling heads of the type already described, permit full utilization of end mills and similar cutters on plain horizontal millers. But in many cases, end mills may be used to advantage by mounting them directly in the spindle ends, using proper types of adapters for the purpose. Manufacturers of plain milling machines make adapters for this purpose which will fit their plain millers. Some of them show adapters of this kind



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in their catalogs. Some very intricate operations can be performed with full satisfaction in this way. In some cases, the setups are even more satisfactory than if the work were handled on vertical milling machines.

An interesting case of this kind may be seen in Fig. 1, where the job requirement was milling of a 3.333" radius on special cam gears. The job was performed on a No. 3 plain horizontal miller. A dividing head was used to hold the workpiece and to turn it by hand against the cutter. The cutter, as can be seen in the picture, is an end mill. This tool is 3/4" diameter, has two cutting lips, and is revolved at 1,000 rpm for this job. You will notice there is a segment of the workpieces on which gear teeth are cut. Feeding the work to the end mill for machining the radial face on the periphery, it is a simple matter to feed up to where the gear teeth begin, and stop with high accuracy, since the dividing head crank is turned by hand to feed the work. Really, in a sense this amounts to a turning operation, and one that could not be done on the lathe.

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Another interesting setup in which an end mill is used in connection with a plain horizontal miller can be seen in Fig. 2. In this case, the job is that of channel-milling connecting rods of the articulated type. A relatively massive fixture is used for holding the rods in proper position, this fixture being firmly bolted to the machine table. A nice finish is desired in the channels milled in these rods. In order to obtain it, they are first rough milled with a two-lipped end mill, and then the final milling is performed with a coarse-tooth spiral end mill. There is a distinct advantage on this particular job in doing this channeling on a horizontal machine rather than a vertical type, because the chips naturally fall from the channel as they are formed. If the same job were done with an end mill in a vertical spindle miller, there probably would be a certain amount of marring of the finish of the cut from accumulating chips in the channel.

In order to obtain a highly finished job with any end mill, sharpening of the

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This heavy duty unit combines careful scientific construction with extreme portability. Can be plugged into any electrical outlet. Voltage 110-115 AC. Inside spacious opening 3½"x10½". The lighthouse beacon pilot light is an exclusive feature, the red glow being visible from all sides and warning operators to shut off unit when not in use—thus adding many years to life of machine.

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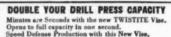
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tool is important. In fact, sharpening of all end mills is vital even tho they are of the type used for roughing cuts. It may not be known generally, but the importance of this particular phase of milling operations has led at least one manufacturer to devise a special sharpening fixture for the purpose. This fixture has a cleverly arranged support for the end mill, which holds it right in the flute directly under the point where the grinding wheel is contacting it. The arrangement is such that no lead cams and no centers are required. It is designed for use with any grinder having a flat table. no table movement being necessary for its successful use. It will re-sharpen end mills from %" to 11/4" shank diameter. and no high degree of skill is necessary in its use.

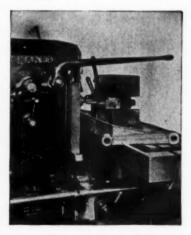
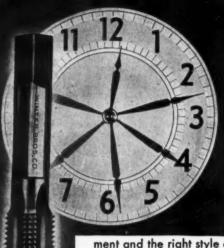


Fig. 2—Setup for channel-milling connecting rods of the articulated type. Note the relatively massive fixture used to hold the rods in position. (Brown & Sharpe photo).

Proper care of all your milling cutters is important. If you are having any trouble, the cause is just as likely to be found here as in the machine itself. Chatter very often causes poor finish on milled surfaces. If too much clearance has been given to the teeth, it will cause

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chattering just as surely as chattering may arise from lack of rigidity in the machine itself. For this reason, some of the manufacturers of milling cutters who have made a careful study of such matters provide form relieved cutters with an eccentric type of relief. This gives a roundness on the back of the teeth that provides a sufficient amount of clearance without weakening the teeth to the point where chattering can result. Such cutters always retain original outline of form, because they are sharpened by

grinding only the face of the teeth, and the required form is milled into the eccentric portion on the back of the teeth. However, there is much variation in the application of form cutters. When one is considering the use of such cutters, a blueprint of the part to be milled should be furnished the cutter manufacturer. with the position of the cutter indicated on the surface to be milled. All important dimensions and tolerances on the work should be furnished. On cuts that are not bilaterally symmetrical, direction of rotation also must be shown on the blueprint and cutter setup. This can be done by writing in the words "bottom going" or "bottom coming", as the case may be. One firm making a specialty of such cutters, puts an indication on them which shows the amount of undercut or rake that must be preserved on the teeth during successive grindings. It should be plain, with a little thought, that any change in this rake will alter the effective contour of the cutting portions of the

Heavy and deep slotting has always been a problem. To machine such a slot at one pass is to lend wings to production, but operators know the problems attendant, whether it has been the custom to cut a given slot with an end mill, or with interlocking side mills. One difficulty with conventional interlocking side mills is that the face edges form a sort of a vee which in some cases pocket chips. These chips foul over the edges to some extent, with the result that the tool does not remain sharp so long as it otherwise would.

It is interesting to note that this particular drawback has been eliminated in



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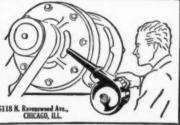
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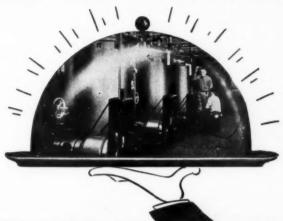
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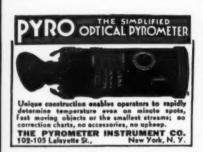
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. S. HOFFMA

a new type of interlocking side cutters recently developed by a milling cutter specialist. The tooth design on these is such that when they are placed together in a pair, the tooth edges are practically continuous. The chips flow freely and do not tend to stall the cutter. To put it into other words, on the ordinary interlocking side cutters, if each cutter had 22 teeth, you would in effect have 44 different cutting teeth when the pair of cutters was used together for slotting. With the newly-designed cutters mentioned, when you place two cutters, each having 22 teeth together for slotting, you really have but 22 effective tooth edges, and these are arranged for the same shearing type of action as ordinary interlocking cutters.

Be sure to watch your cutter speeds carefully, especially with reference to speeding up very small cutters. Keep the surface speed for very small cutters the same as that required for larger cutters, no matter how high the rpm may seem to be. If this is done: if the cutters in any given setup are located as close to the spindle as can be arranged, and if you use arbors of ample diameter and provide sufficient arbor support, you have the rigid setup conditions that are essential to good work. Keep that big word rigidity in the back of your mind as being synonymous with good milling. Cutters must have rigid teeth. The arbor must be large enough to be rigid. Assure rigidity by mounting the cutters as close to the spindle as possible, and thereby shortening the leverage on which the cutting thrust can act. Added to all of these points the work must be held rigidly. Admittedly, the machine itself must be in good condition and sufficiently heavy and rigid to stand the cut.

The rigid holding of workpieces, in itself, often is something of a study. While the ingenious operator can in most cases devise a proper method of holding with standard shop equipment, there are many cases in which special fixtures are necessary for best results, especially in production setups. There are engineering firms making a specialty of providing fixtures of all kinds, including milling fixtures. One such firm in particular caters to war contractors with tooling problems to be solved. So many excellent vises and work-holding devices have been designed and manufactured with particular reference to holding work at the milling machine, that it pays to look over this field before deciding too hastily on a special fixture. A subsequent article will be devoted to a consideration of vises. etc., that are suitable for use in connection with milling machines.





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tomorrow... TIME DOES NOT
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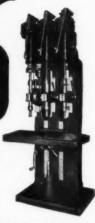
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ON THE PRODUCTION FRONT

High Speed Milling of Steel

S LOTTING, at best, is a troublesome operation. The set-up inherently is conducive to vibration and, in addition, peripheral milling presents difficulties that are absent in other operations.

The relationship of cutter to workpiece is such that a perfectly rigid arrangement is impossible. Depending upon the diameter of the cutter, the distance be tween the point of contact of workpiece with cutter and arbor is such that the cutting forces will tend to distort and vibrate the cutter.

Moreover, if consideration is given to the angle

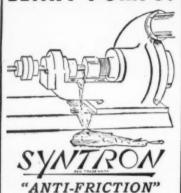
between the cutting face or tip and the workpiece, it is obvious that the shallower the slot or trough, the steeper will be the positive angle of entrance of the tip into the workpiece. Thus, even tho a negative rake is being used in a carbide cutter for the milling of a slot in a piece of hard steel, the angle of entrance will be a decided positive, the more so the shallower the slot. That is to say, even tho a negative rake angle is present in the cutting face, the cutting tip will present a positive angle to the top surface of the workpiece at the moment the tip begins to enter the workpiece. To be sure, this angle becomes a true negative



once the tooth is fully "in the cut", but until then the angle of entrance is positive.

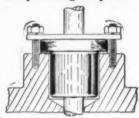
This is an important consideration because of the effects of positive angle relationship between workpiece and cutter on carbide tips. This cutting material, as is well known, has little strength in tension. If then the unsupported portion of the tip strikes the workpiece first, the tendency will be quickly to break down the carbide cutting edge. If the angle of entrance were a true negative, the cutting pressure would be directed not at the unsupported tip, but away from the

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edge a distance equal to the chip thickness,

This preliminary and somewhat theoretical explanation is intended to warn against too great expectancy of results in slotting with carbides. And yet good cutter life, better than with high speed steel, is not only possible but a matter of daily record.

A slotting operation, significant for a number of factors and specifications, is shown in Fig. 1. Here a slot ¾" wide and ¾" deep is being milled with a carbide cutter employing an interesting and yet effective combination of angles. The rake angle or angle made by the cutting face with the radius of the cutter is, in this cutter, zero degrees. The helix angles made by the cutting face with the axis of the cutter are here, each 10 degrees negative.



Moreover, and this is important, as will be explained directly, reliefs are ground into the O.D. in such fashion that at no time is a tooth cutting a chip as wide as the slot. It will be noted from a close examination of Fig. 2 that the center of each tooth is stagger-relieved, and likewise, the two outside portions on the tip periphery.

Chip formation and size are important in negative angle milling of steel. In the rapid removal of metal by this process, it is absolutely necessary that in slotting, the chip be at all times free and quickly ejected from the slot. If it were as wide

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as the slot, it is highly improbable that the chip would be thrown free; more than likely, as experience shows, the chip would take a "free ride" by getting caught between the carbide tip and the slot side, thus abrading the tip and quickly disintegrating or breaking it down. Free and easy chip ejection is necessary and usually can be quite well accomplished by forming a chip narrower than the width of the slot.

While discussing chip formation, it is well to insist on a fundamental of nega-

tive angle, or carbide milling of steel, viz., the chip thickness, or chip load, must at all times be as high as the machine power and other job factors (such as rigidity) will permit. A thin chip is opposed to good cutter life and the reason is not difficult to grasp. The thicker the chip, the farther from the unsupported cutting edge will the pressure be applied to the carbide tip. Hence in the milling of steel, a .010" chip load or thickness is considered average or at least a figure to be desired.

In the operation pictured, the chip load is approximately .010" since the feed rate is 20" per minute and the number of teeth effective, is four. This cutter has eight teeth but because of the staggered reliefs on the O. D., as previously explained, only four teeth are effective. The spindle speed is 529 rpm. All this adds up to a chip load, as can be calculated quickly, to approximately .010".

At 527 rpm, the surface foot rate for this 6" diameter cutter is 833 feet per minute. This seemingly high peripheral speed is, nevertheless, in the right direction. It is better high than low. The worst enemy of carbide is friction, abiding, continuous and long applied friction. This is prevented, or at least reduced, by a high peripheral speed.

The material being slotted as shown in Fig. 2 is SAE 4140 specification with a Brinnell hardness of approximately 210.

The machine used for this job is a No. 2 horizontal equipped with a rather large fly wheel that serves to reduce the impact shock on spindle, and gear trains as well as the carbide tips. The installation and use of a fly wheel is important and necessary for reasonable cutter life.

This operation is being performed "climb fashion", which helps to increase rather than diminish the rigidity of the set-up. All negative angle milling jobs should be milled "climb" or "down cut" if at all possible. The rigid set-up accomplished by means of the close hook-up between arbor supports and cutter is noteworthy. The fundamentals of milling must be closely observed in the carbide milling of steel. A violation that could go unnoticed in traditional milling will cause no end of trouble in the high speed milling of steel.

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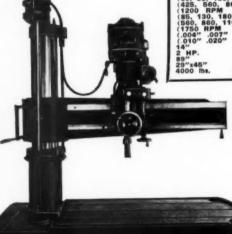
Drills to the center of circle on base or the control of arm Greatest distance from spindle to base Minimum distance from spindle to base Minimum distance from spindle to column Traverse of spindle Hole in spindle—Morse Taper Diameter of spindle at nose Traverse of head on arm Traverse of head on arm Spindle speeds with 1200 RPM motor

Spindle speeds with 1800 RPM meter

Feeds per revolution of spindle

Bearing of arm on column Size of main driving motor Height of drill column over gears Working Surface of Base Net weight

9" Column	11" Column 4' Arm	11" Column 5' Arm
731"	96"	120"
431"	48"	46"
101"	10"	10"
91" No. 4	No. 4	No. 4
25."	361"	48
21½" (60, 85, 13 (425, 560,		on all models
(1200 RPM (85, 130, 1 (560, 860,	80. 274.	on all models
(1750 RPM (.004" .007 (.010" .020	109	on all models
14"	2 HP.	18" 2 HP.
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TAXING INVESTMENT PROFIT

By Arthur Roberts

ONE suggestion that keeps cropping up in Congress and seeping into legislative halls from influential outside sources is that the excess over a certain percentage of return on invested capital should go to the government. In other words, it would place a ceiling on the return on the capital invested in your business.

Recently the Congress of Industrial Organizations and the Brotherhood of Railroad Trainmen, with the support of the National Farmers Union, the League of Women Shoppers and the National Lawyers Guild recommended that all profits above 5% of invested capital be taxed as excess profits. This, if enacted, would play havoc with the financial stability of many machine tool users and make the transition from war to peacetime production much more difficult than otherwise. Inasmuch as there is so much "fat in the fire", machine tool users should know something about the subject so they can consider such proposed legislation intelligently. With the tax situation as it is; with frantic attempts being made to get income to pay current government obligations, there is no telling what source the legislators will tap to supplement the tax on income. There is sufficient indication that a ceiling on capital investment is being considered seriously enough to make it worth your while to absorb the fundamentals of this problem.

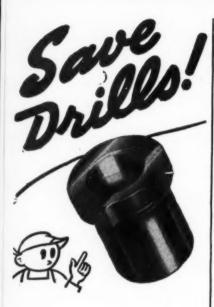
To illustrate the subject clearly, consider this condensed recap of Company A's profit and loss statement and balance sheet for 1943:

Sales	\$300,000
Net profit on sales in percentage	.06%
Net profit on sales in dollars Assets Liabilities	\$200,000
The capital investment or net worth. Say the ceiling on capital investment is	.069
This would limit dollar profit to Net profit on sales in dollars Ceiling on capital	\$18,000
investment in dollars	9,000
Differential deducted from profit	\$9,000

If Company A's profit on capital investment were limited to 6%, they could earn only \$9,000, or 3% on sales, instead of 6%. These figures show clearly what dynamite lies in the suggestion to limit returns on capital investment.

Contrast Company A's position with that of Company B. A condensed recap of their profit and loss statement and balance sheet follows:

				percentage	.06%
Net profit	on	sales	in	dollars 3	12,000
Assets	***				00,000



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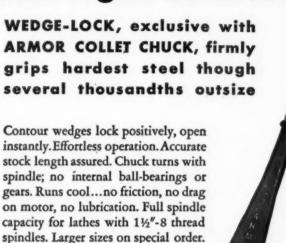
The capital investment or net worth.\$30 Suggested limit	00,000
on capital investment	.06%
Would limit dollar profit to 1 Net profit in dollars \$1 Ceiling on capital	8,000 2,000
investment profit\$1	8,000

Company B is earning only 4% on capital invested (\$12,000 net profit on sales is 4% of \$300,000 invested capital), whereas, Company A earns 12%. Hence, A is, by far, the better managed organization. But under a 6% limit on capital investment profit. A would be compelled to cut net profit on sales to 3% and turn over the difference, \$9,000 to the government. On the other hand, B could retain all the net profit earned, \$12,000. B did not make its invested dollars work hard enough, indicating inefficient management or watered assets, which give an inflated figure on invested capital. Company A, because of being more efficient and because of conservativeness in recording balance sheet figures, would be penalized if the proposed legislation becomes law. Some taxpayers would be hurt by such legislation, others unscathed. You should know where you stand.

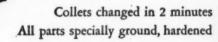
A ceiling on capital investment profit to get revenue to operate the government, would bring these major reactions, over which the machine tool users should ponder:

- (1)—The balance sheet with water, water everywhere would get priority on profits. The balance sheet, conservatively computed, would bring a penalty to the owners.
- (2)—Other factors being equal, a high utilization of fixed capital, because of more modern equipment or better management, would yield a high return on investment, or the company getting a bigger profit out of small outlay, (under old standards considered a topnotch organization) would be penalized.
- (3)—Business property valuation would influence profits. One company might have appreciated property value since purchase. Another might capitalize maintenance and repairs to build a substantial net worth on paper for the benefit of

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HENRY P. BOGGIS & CO. 1279 W. 3rd St. Cleveland, Ohio credit men. Still another company might list real estate conservatively and charge repairs to profit and loss, keeping asset value at minimum. The company owning a plant for years and having written it practically off the books thru depreciation would have a lower net worth, all things being equal, than the company acquiring title later on and still showing this asset at a substantial sum or writing it down with smaller depreciation rates.

(4)—Some concerns on civilian production, because of war restrictions and higher costs, may show deficits on their financial statements. Just what status a company with a deficit would have is not clear, if profit on investment is limited. Probably, they would get out of the barrel under this plan because their profit on sales would not be restricted by a ceiling on investment profit. They could build volume substantially by underselling competition not so favorably supplied with deficits. Just another of the "bugs" hidden in the limitation of profit on investment.

(5)—The company with the biggest net worth and often the organization better off financially to pay increased taxes, might slip thru the sluiceway unharmed if this legislation came to pass. The company with the biggest investment, as measured by net worth, would pay less than one doing similar volume and making similar net profit, yet, not having so big a net worth. This certainly is discriminatory and may put out of business many concerns with low capital investment.

(6)—A ceiling on profit on invested capital may imperil working capital because it will siphon out of business the liquid funds normally used to keep operations moving. Aggravating this trend in the postwar period will be expanded volume for producers of civilian lines, which always requires additional working capital; also reconversion expense for plants on war work. Hence, these Gremlins may curtail expansion and reconversion unless concerns are able to borrow working capital.

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The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading. Operations In One For Set-Up Jig Borer, **Drill Press.** Patent Milling Pending Machine

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3' dia. x 4" long, Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO. 514 OHIO AVE. MUNCIE, IND.

CHANDLER

BORING AND FACING TOOL HEAD

In 1942, I analyzed the figures of a number of Eastern concerns on the subject of earnings on investment and present a few case histories that will give readers a better understanding of this vital prob-

One concern (A) earned 4.7% on sales and 6% on investment. Another (B) earned 2.8% on sales and 7.4% on investment. Another (C) earned 4.2% on sales and jumped to 11.9% on capital investment.

Figured by the usual yardstick-profit on sales-it would seem that A did the best managerial job. This however, is erroneous because the ratio of profit to net worth or capital investment is the ultimate measure of profitableness-not necessarily the profit on sales, which explains why there is agitation for a ceiling on capital investment. Company C did the best managerial job.

It is obvious that the limitation of earnings on investment to 6% in the case of Company C would limit their profit on sales to about 2%, whereas, Company A would be permitted to retain 4.7%, retained for no other reason than that they were unable to get as many profit-dollars out of their total invested dollars as Company C.

This article is written to induce you to give thought to this proposed tax on investment profit. Determine what it will do to your financial position and operating efficiency. Fore-warned- is fore-armed. Consideration of this problem now will put you in a better position to cope with the legislation, should it come to pass or to take action thru your representatives now to forestall passage.

ISOMETRIC SKETCHES ARE



EASY TO MAKE AND READ !

One trial will make you another steady user of WADE'S 180M-ETRIC blue lined paper. Shows all surfaces and in-

terior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. Write for Circular. Wade Instrument Co. 1422 E. 199th St. Osph. H.

Dept. H.



THREADED PLUG GAGE

Threads smaller than the papillary ridges of a finger, ground to an accuracy of .0001 of an inch – that's what you get when you buy a VARD 0-80 NF Threaded Plug Gage * We specialize in the manufacture of extra fine, Right or Left Hand threads, special thread forms and extreme tolerance gages * In some of the standard thread sizes in NEF, NF and NC gages, from sizes 0-80 to 1½ in., we can supply gage members out of stock. These fine threads as well as special threads can also be obtained in any size ranging from 0-80 to 12 in. and can be made to fulfill your requirements. Deliveries are being handled in a reasonable period of time * VARD gages are made from special tool steel, hardened, ground and lapped. They are tested on the most exact mechanical and optical inspection equipment and come to you in waterproof cellophane enclosures,

VARD INC. securely packed in individual boxes * Write for more complete information on any VARD products.

Thread & Plug Cages . Snap Gages (VARD or JOHN-SONS Type) . Special Taps . Procision Cround Optical Lanses & Filters . High Fidelity Mirrors

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TAP GRINDER

Please send folder giving complete details on the Blake Tap Grinder.

H.

This comment was made by a manufacturer who has a girl operating their Blake Tap Grinder on ½" 20 taps. The chances are, you too will find the Blake a profit maker in your own shop—not only by extending the life of every tap, but, by keeping taps sharp, machine efficiency is improved and less spoilage and broken taps result.

The Blake Grinder will sharpen the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 or 10 flutes. Capacity — No. 0 to 2". Mail the coupon for full details.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

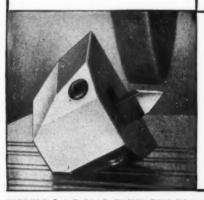
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One fixture for grinding both National 60° and Acme 29° thread tool bits, insuring close tolerances. Saves vital materials and time. Accurate, uniform cuts. For use on any surface or cutter grinder.

CORRECT THREAD ANGLE

Every compound angle is predetermined to provide correct thread angle and clearance—no guesswork. All bits may be ground with or without rake on cutting face. Ideal for Carbide tips, all bits.



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Mechanics' Model A for bits 1/8"-38" weighs 11/2 lbs.—\$16.75... Heavy duty Model B for bits 1/8"-58" weighs 61/2 lbs.—\$35.00. Both complete with right and left hand adapters. Magnetic chuck convenient but not essential. Easily clamped to work table.

WRITE FOR BULLETIN No. MTBB-2

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LINCOLN PARK TOOL AND GAGE COMPANY LINCOLN PARK 25, MICHIGAN

1943 ARC WELDING DEVELOPMENTS

By R. F. WYER*

NE of the outstanding developments during 1943 has been the extension and perfection of gas-shielded arc welding methods. Both argon and helium have been used successfully to provide an inert gas shield around either a tungsten or carbon arc welding electrode when welding of magnesium alloys in particular, and some other alloys as well.

Arc welding of magnesium in the repair of castings, has been widely extended. Army Air Corps specifications permit use of inert gas-shielded arc welding for certain repairs on magnesium alloy castings. Indications are that this process will make an important contribution to conservation and production in this field.

A large amount of developmental and experimental work has been done on gas-shielded arc welding of wrought magnesium alloys in preparation for the apparently inevitable wide adoption of extrusions and rolled sheet in the metal-working industries. Notable among the results of this developmental work are the so-called "reverse-bevel" joint preparation for butt joints in thin magnesium alloy sheet, and the use of formed backing strips of stainless steel for the same type of joint. Both of these developments look toward improvement of joint strength and soundness by controlling the amount of drop-thru, and

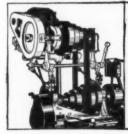
the dispersion of the oxide present on plate edges.

There were two marked trends in the alternating-current arc welding field. The introduction of AWS Class E-6011 electrodes for high-quality vertical and overhead welding with alternating current was followed during 1943 by an important extension of the use of a-c arc welding for all-position high-quality work. Electrodes in Class E-6011 are now available in 3/32", 1/4", 5/32", 3/16" and 1/4" diameters, and have characteristics comparable with those of the reverse polarity electrode so widely used for d-c arc welding. One of the outstanding characteristics of the E-6011 electrode now in wide use is its remarkably high elongation combined with high yield point and ultimate tensile strength.

The other trend in a-c welding has been toward use of outdoor type welders. Completely dripproof and specially treated to resist atmospheric moisture, these units have been particularly attractive to shipyards, where the complete protection of welding equipment from the weather is often difficult.

This latter trend has been accompanied by a wide interest in idling voltage con-

*Welding Engineer, General Electric Co., Schenectady, N. Y.



Avoid costly shutdowns.

A "short" in a motor can't "gum-up" production from a machine tool equipped with a Romco Drive. Simply unbolt and remove the "dead" unit and substitute another motor—a matter of minutes. Only the Remco Motor Drive has a patented universal motor mounting which takes any motor of reasonable size—new or USED. Nothing else like it! Write—Remco Products Corp., State St. at R. R., York, Po.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

trol panels-both built into outdoor welders and as separate panels-which reduce the no-load voltage of the welder to approximately 30 volts, practically elim-

inating no load losses.

Of considerable interest also is the effect of the wide-spread campaigns during 1942 to reduce electrode consumption. Altho ratios of electrode consumption to steel fabricated in shipyards still vary widely from yard to yard, the over-all trend during 1943 was noticeably downward.

As in 1942, the past year has been marked more by prodigious efforts to increase production than by the number of entirely new developments. Some developments have undoubtedly been held back by preoccupation with production problems, and these, added to the results of basic research which has gone thruout 1943 should result in important new trends in the arc welding field in 1944.

KENNAMETAL FILES

Kennametal Inc., 135 Lloyd Ave., Latrobe, Pa., has developed a new type of file made of the same hard, high strength cemented carbide compositions as their steel-cutting lathe and boring tools.

The makers emphasize that this file meets a present-day need. Lathes have been "revved up" to speeds necessary for efficient, enduring performance of carbide-tipped cutting tools, and the ability to file revolving work pieces without reducing speed is a valuable aid to maintenance of production. Ordinary steel files, when used to remove burrs, for example, will break down at such high cutting speeds.

Extended service trials are said to have demonstrated that the new file will permit filing speeds of three to 10 times that possible with steel files, and outlast them 50 to 200 times. Manufacturers point out that the files will cut steels of a hardness up to 62 Rockwell C, which the ordinary file will not touch, doing a noteworthy job on cast iron and brass at surface speeds around 900' per minute. Highcarbon, high-chromium steels have been filed at 800 sfm with the files still in good condition after three weeks of use, compared to steel files lasting only one day on this work.

At present, Kennametal files are available in one size, called the F76. It is 11" long, ¾" wide, and ¾" thick, having a substantial filing surface 4" long, made of grade K4H Kennametal (80.6 Rockwell C), single cut with teeth at 30° shear angle. 40 per inch. Convenient grips for the

operator's hands are provided.

PRODUCING FOR VICTORY THROUGH FOUR GREAT WARS!

For over 100 years . . in peace and in war . . . the name DESSAU has meant the finest in DIAMOND TOOLS!

Today, leading industries specify and insist upon DESSAU DIAMOND TOOLS. Every diamond must pass rigid tests as to hardness, shape and con-struction before it is set in your specific type of tool.





Diamond Dressing Tools for use on Cincinnati, Landis, Norton, Heold, Brown & Sharpe, Excello, etc. Grinding Machines. Immediate delivery on all tools. Write Dept. M.T. for newest Catalogs and Price Lists.



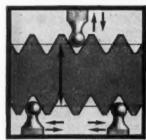
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Dessau Diamonds True the Wheel, of Indu t.y





MODEL 458-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball amvils float sidewise independently to compensate for any variation in lead.

TWO FULL COLOR FILMS (With Sound)

No. 1 DIAL INDICATORS
No. 2 DIAL INDICATOR GAGES
20 minutes such. For instruction and troining
For showing write

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so definitely and so quickly the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just how much and where the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below.

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PRECISION MEASURING

INSTRUMENTS

Incorporate Cutting Tool Manufacturers' Association

A RTICLES of Incorporation for the Cutting Tool Manufacturers' Ass'n., a non-profit corporation, have been filed in Wilmington, Del., according to W. G. Robbins, Chairman of the Board of Directors elected at a recent organization meeting in Detroit.

The Board has also completed preparation of By-laws and these are now being distributed to those in attendance at the meeting, complete with membership application blanks.

Plans are nearing completion for holding of organization meetings in other industrial sections of the country. At these meetings, purposes of the organization will presented to members of the industry in other areas in the same manner as at the meeting for Michigan Companies in Detroit.

A review of the By-laws reveals that membership is available to any individual partnership, firm or corporation engaged in the manufacture of tools designed for cutting materials thru the use of power driven machinery. Manufacturers of hand operated cutting tools are specifically excluded.

There is no initiation fee for membership but dues are on a sliding scale, depending on the number of employees of the individual manufacturer's organization. In contrast, however, each manufacturing organization, regardless of size, is entitled to but one vote in Ass'n affairs.

The By-laws provide for a President, Vice-President, and Treasurer, as well as an Executive Secretary. All except the last named will serve without compensation and will be elected by the Board of Directors. The Board of Directors is to be made up of 12 members, not more than six being from any one state. To expedite growth of the Ass'n during its first year, however, this latter provision does not take effect until the 1944 Annual Meeting.

To give other sections of the country representation during the first year of

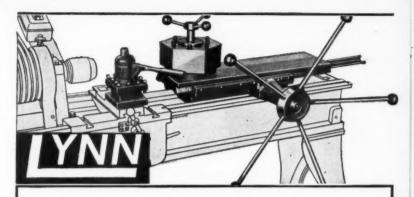
operation, provision has been made to elect three directors from such other sections-these being in addition to the nine members already elected. In addition to Mr. Robbins, (President of Carboloy Co., Inc.,) the Board is composed of Oscar L. Bard, President, Michigan Tool Co., Detroit; George L. Buffington, Supt. of Estimating & Process Engineering. Ex-Cell-O Corp., Detroit; E. A. Goddard, Vice President, Goddard and Goddard Co., Detroit; Norman Lawton, Partner, Star Cutter Co., Detroit; R. G. Michell. President, Eclipse Counterbore Co., Detroit; E. C. Putnam, President, Putnam Tool Co., Detroit: R. M. Severance, President, Severance Industries, Inc., Saginaw, Mich.; and R. H. Wolfe, President, Arrow Tool and Reamer Co., Detroit,

Following the 1944 meeting, four directors will be elected each year. In this manner, continuity of effort can be maintained. Election to the Board of Directors is by the membership from nominations by a Nominating Committee, not more than one member of which may be a member of the Board of Directors. It is provided also that not more than one representative of any one company may serve as a Director or Officer.

Neither can any member or representative of a member serve as a director or officer for the Ass'n for more than seven consecutive years.

While membership dues are not high, they are adequate to permit employment of a high-caliber executive secretary with the necessary clerical force.

Among the purposes of the Ass'n are assistance, not only to the cutting tool industry but also Federal and local agencies on such subjects as renegotiation, taxes, contract cancellation and termination, disposal of surplus cutting tools by the Armed services, standardization of cutting tools to permit greater simplification of production equipment and methods, problems arising from cancellation, etc., of pool orders and post-war disposal of emergency manufacturing facilities.



NEW NO. 3 LARGE BED TURRET Converts Large Engine Lathes for Screw Machine and Turret Work

Meets today's urgent need for quickly, economically tooling up present equipment for precision work and speedy production on varied items—long or short runs—with unskilled workers. [Also for replacing turret on standard turret lathes (has adjustable base). Fits lathes up to $24^{\prime\prime}$ swing. $91_2^{\prime\prime}$ hexagon head, $10^{\prime\prime}$ travel, easy-action large pilot wheel, 6 positions, automatic indexing of stops to each position. Designed to bore out $11_2^{\prime\prime}$ or less on your own lathe. Sturdy, heavy duty construction—engineered as carefully as finest turret lathes.

CUT-OFF CROSS-SLIDE available with back and front adjustable tool posts.

LYNN Model BT-1 for Smaller Engine and Bench Lathes



SELF-INDEXING, Heavy Duty, fits standard lathes up to 13" swing. Six positions, automatic index, easy lever action, 6-inch heed, 5½ inch travel, stops for each position. Furnished with 34" holes designed to bore out to 1" on your own lathe. Sturdy, rigidly accurate, versatile, simple in operation.

Cut-off cross-slide has two tool posts with adjustable jacks; handles recessing, forming, cut-off and similar work.

PROMPT SHIPMENTS - WRITE for DETAILS

LYNN MFG. CO. • 218 Elroy St., Minneapolis 8, Minn.

THE SECRET OF MEEHANITE METAL SURFACE PLATES IS SCIENTIFIC DISTRIBUTION OF WEIGHT!



These Meehanite Metal Surface Plates are one-third heavier than any other quality surface plates. Moreover, the weight is scientifically distributed over the entire surface by means of the honeycomb base.

They are hand scraped to extremely close tolerances, are of uniform texture, fine close grain, unusual strength and solidarity.

SIZE	APPROX	. WEIGHT	HEIGHT	TOLERANCE	NET I	RICE
6x 6	11	Lbs.	21/5"	.0001"	.8	19.00
8x12	38	99	31/2"	.0001"		35.00
9x12	40	99	31/2"	.0001"		35.00
12x12	50	99	31/2"	.0001"		43.00
12x18	85	99	4"	.0001"		68.00
14x18	100	79	4"	.0001"		75.50
18x18	140	59	41/2"	.0001"		98.00
18x24	200	99	5"	.0001"		133.00
18x36	310	99	61/4"	.0002"		174.00
20×30	325	99	51/4"	.00025"		190.50
24x24	334	99	61/2"	.00025"		180.00
24×36	475	99	7"	.00025"		275.00
30×36	510	99	7"	.00025"		345.00
30×60	1425	99	10"	.00025"		596.50
31x78	2100	99	10"	.0003"		827.00
18x72	4500	99	12"	.0004"		054.00
18×96	6000	99	12"	.0005"		468.00

FOR PROPELLER INSPECTION: RIBBED PATTERN

8x42	238 Lbs.	6"	.0001"	98.00
10x36	225 "	6"	.0001"	115.70

Other sizes to specification. Angle plates and straight edges of Mechanite Metal also available. Good deliveries on most sizes. Write for folder. Send for Precision Production Tool Catalog 42.

ACME TOOL COMPANY - 200 CHURCH STREET NEW YORK, N. Y.

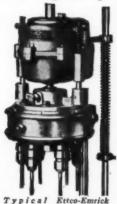
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SYSTEM OF MULTIPLE SPINDLE HEADS will give you highest possible production



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Head for tapping 6 holes
simultaneously. Quil
Clamp, supplied with each
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work. Same gear case assembly can be used for
drilling the holes.

It will do this because the first thing Ettco-Emrick engineers do when they get your drawing or sample of a part, is to figure out the handling and feeding method that lets you drill or tap all required holes **simultaneously** in one or more of the parts.

Then the Ettco-Emrick High Speed Multiple Spindle Head needed to carry out the method is made up entirely of standard stock parts.

Finally, a drawing is made of the fixture you need to set up and feed the parts for the drilling or tapping. This drawing goes to you with the Head, or we will build the fixture to order.

Get full details of this system that has solved scores of drilling and tapping problems for many manufacturers. Write today for **BULLETIN No. 3.**

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.
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Immediate Shipment STEEL BOXES

PRODUCTION



STYLE 300 STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handles each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301—6"x 9" x3½"—20 ga., \$.55 Ea. No. 302—8"x12" x4" —20 ga., .60 Ea. No. 303—9"x13½"x4½"—19 ga., .75 Ea.



STYLE 700 STACKING BOX

A light weight box designed for quick identification of contents. Will stack with No. 303. Finished olive green enamel, baked on.

No. 703-0G—9"x131/2"x41/2"—19 ga., \$.95 Each



STYLE 600 STACKING BOX

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as positive stacking lock and reinforce box at point of maximum wear.

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Perfect for the handling of small parts. Open front makes contents easily accessible when boxes are stacked. Will stack with No. 601.

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Prices F.O.B. Factory, Philadelphia-Any Quantity! Order Today-Write, Wire or Phone.

AMERICAN METAL WORKS, INC.

1502 GERMANTOWN AVENUE

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Sou Talk Shop

EXTENDING TOOL LIFE

SOME months ago when fears of a cutting tool shortage loomed, Axel E. Lundbye, Chief Engineer of the Crowell-Collier Publishing Co., Springfield, Ohio, began investigating methods of extending tool life.

He soon found that chrome plating the cutting edges of tools offered a most promising method of increasing tool life. However, some embrittling of the tools was encountered evidently as a result of hydrogen picked up on the tool faces in the plating bath. Experiments were made with different methods of relieving this hydrogen embrittlement. None were quite

so satisfactory as the use of a heated oil bath. Apparently the oil bath releases the hydrogen absorbed, along with chrome and by so doing, reduces brittleness of the base material.

No involved process were used in the plating baths. Cutting edges to be plated were first ground. Afterwards they were honed with fine stones to give a smoother finish and a cleaner steel surface preparatory to plating. The cutting edges then were dipped into a 10% hydrochloric acid bath for 30 seconds and rinsed in cold water.

The plating bath consisted of 50 ounces



Mr. Lundbye at his desk, with some typical samples of chrome plated tools.



BOYAR-SCHULTZ SMB BOLTS Save the Machine . . Save the Job . . . Save Time

Poorly made machine bolts or bolts that have become worn and distorted can cause great damage to the accuracy of machine beds. Accuracy thus destroyed can be restored only at considerable expense.

Boyar-Schultz SMB Bolts are made from alloy steel, heat treated for maximum properties. They are machined with head square with body, assuring a clean, flat bearing surface to fit the upper side of T-slot. Work is held tightly under heavy machine and close adjustments are possible.

For best results use SMB Nuts and Washers. They are made specially for SMB Bolts.

BOYAR-SCHULTZ CORPORATION 2108 Walnut Street, Chicago 12, Illinois of 99.75% chromium trioxide, dissolved in water, to which 0.5 ounces of concentrated sulphuric acid was added. The solution then was made up to 128 ounces or one gallon. The same proportions hold true for any quantity of plating solution.

Allowance has to be made for the sulphate content of the chromium trioxide in adding sulphuric acid to the bath. Temperature during plating is held between 110 and 150° F and current densities range from 130 to 200 amperes per square foot, depending on the material to be plated and the type of plating required.

The tool to be plated is used as the cathode and immersed with $\frac{1}{4}$ " of solution over the cutting edge. A lead anode is preferable tho stainless steel can be used. The article to be plated governs its size.

In the first step, the current is reversed for a short time from 200 to 400 amperes per square foot, again depending on the material to be plated, making the tool the anode. Terminating this period, current is again reversed once more so the tool again becomes the cathode, at 130 to 200 amperes per square foot. After this has been done and the tool given a flash plating, current is decreased immediately to 120 to 180 amperes per square foot. The plating then continues for a definite period of time. This time limit is quite variable, ranging from one to four minutes for each square inch of steel surface exposed to the plating bath, at a definite current density, best determined by experiment,



STAGES IN THE GRINDING OF A SOSSNER

OCTUPLE THREAD TAP

(8 STARTS)

A tap that calls for the highest degree of tap making skill. Each start must be precisely indexed and then precision ground for perfect size, lead and thread spacing on the

lead and thread spacing on the finished tap.

Step 1 Step 2 Step 3 Step 4 Step 5

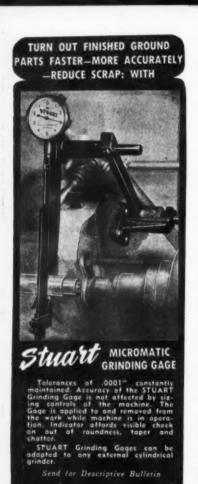
TAPS GAGES CUTTING TOOLS STEEL STAMP

FINISHED TAP

Step- 8

161 Grand St., New York City 13, or 27 Broadway, Lynbrook, N. Y.

Step 6



OF MARTIN AUTO PARTS CO.

SIVE

E TERRITORIES REPRESENTATION The tool should be removed after plating, rinsed well in cold water and dried immediately. The chrome deposit should be a semi-lustrous blue-white and distributed evenly over the tool. It is important that a bead does not form on the cutting edge of the tool. If this happens, the deposit must be stripped and the tool replated.

Following the plating, rinsing and drying, the tool should be transferred to an oil bath heated to a temperature of about 350° F, where it remains for one hour. Then it is removed and allowed to cool to room temperature. It is believed that this oil bath releases the hydrogen in the deposit and eliminates hydrogen embritlement in the tool. After oil treatment and cleaning, the oil is removed from the tool and it is ready for use.

To avoid formation of a bead on the cutting edge, on tools plated more heavily than the standard thickness of less than 0.0001", it is necessary to raise temperature of the plating bath to 150° F. This slows the rate of deposit and makes it smoother. It permits building up the chromium deposit many more times than the designated thickness.

The process has been tested widely, according to Mr. Lundbye and has proved very satisfactory indeed for use on practically all types of metal cutting tools. It has been shown to increase life anywhere from 100 to 400%. While applications have been made for patents, the process has been released by the company for the duration, on government work, without royalties or other charges. An offer has been made to plate a sample tool for any company doing war work. If the results are satisfactory, the company will be given specifications for the system and the engineers of Crowell-Collier Publishing Co., will act as technical advisers, training personnel to handle the process and helping in the set-up of equipment.

BLUE BOOK has published several articles advocating the practice of high finish and chrome plating on cutting tool edges. One of these was on the Destruction of Tool Surfaces, by E. L. Hemingway, in the October issue. Evidently, the smooth, hard, chrome plated surface resists any welding-on or building up action. It's reported that even the the plat-

BIG

little things with



JOBS

Ultra smoothness and extreme accuracy in the mechanical world mean more efficient operation, more dependability, longer life.

It is the forte of honing and superfinish stones to create ultra smoothness and extreme accuracy; to create those physical attributes far beyond the capacity of anything else man has yet contrived.

MID-WEST MICRO BOND honing and superfinish stones have blazed many new trails in the field of superb finishes and extremely close tolerances. Many of Uncle Sam's weapons of war-tanks, guns and planes—owe a portion of their deadly efficiency to a MID-WEST honing or superfinish stone often smaller than a match. Truly such tiny items are little things with big jobs!

MID-WEST honing and superfinish stones—the world's most efficient abrasives—come in any size, any shape, any grain, any grade. They last longer, cut faster and produce smoother surfaces with less heat.

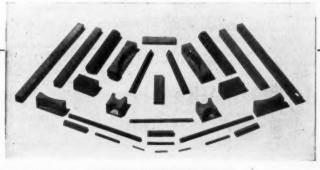
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MID-WEST'S complete line of abrasive products also includes grinding wheels for any purpose, coated abrasives of any type and compounds. Let a MID-WEST service engineer tell you what MID-WEST abraives have done for others. You'll be amazed!





Adaptable to a wide range of light or heavy work, for maintenance or production use . . . adjustable for different thicknesses of dies and material . . . extremely powerful yet little effort . . . ram free from obstruction assuring full vision of work, that makes possible use of longer guide. Complete information upon request. Ask about repair parts service.

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WAUSAU

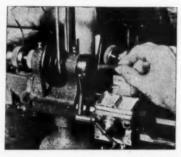


WISCONSIN

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ing may be worn thru on a tool, the remaining life of the tool often is higher than that of a tool which was not plated. Possibly this is due to a chomizing action, as well as the plating action on the tool. Further, it's asserted that plating of plain carbon steel tools has in some instances, permitted their use instead of high speed tools.

OPERATORS TRUE WHEELS



Operators at General Electric's West Lynn Works are saving valuable production time by truing their own grinding wheels with a fine carborundum, \(\frac{4}{n} \) in diameter. An old collet, modified to fit a jeweler's lathe, is used. The stone is inserted in the jaws of the collet and the grinding wheel is brought forward into truing position. This method saves the time previously spent by a set-up man who had to remove the wheel from the operator's machine and grind it on a separate piece of equipment. Miss Magda Gustavson, who suggested teaching operators the truing operation, was awarded \$100 for her idea.

PRESSES RELEASE AUTOMATICS

Shifting production of certain parts from a screw machine operation to a punch press operation has effected considerable savings in man hours, machine hours, and materials at General Electric's Fort Wayne Works.

For example, a small bearing retainer formerly made from bar stock on a screw machine is now punched from sheet material on a punch press. The die used for the job was designed to coin the part at the same time that it punches, thus obviating need for an additional operation on a coining press. Material utiliza-



Increasing production "firepower"—speeding the day of total Victory—that's the story in thousands of plants where production engineers specify Atlas Machine Tools, the tools that take over production of small parts so that capacities of larger machines will not be wasted.

The Atlas Shaper, for example, does all shaping work within a seven inch stroke does it with the accuracy, power, and strength of larger machines. Angular, vertical, horizontal and V-cuts, dovetailing, keyseating, and internal operations are all in the day's production for this rugged compact machine.

The modern design of the Atlas Shaper plus the crank-type ram driving mechanism powered by V-belts and heavy-duty Timken Bearings that transmit maximum power to the ram with smooth action at all speeds, make it possible to operate at full efficiency with a ½ HP motor.

Speeding production for a quicker Victory, the Atlas 4 Tool Team will be a potent profit-making combination after the war. Put it to work boosting production now . . . use it for quick conversion later! Write for full details and address of our nearest representative. ATLAS PRESS COMPANY, 250 North Pitcher Street, Kalamazoo 13D, Michigan.

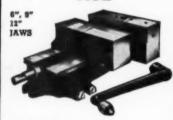




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Request New Illustrated Circular.

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tion with the new method is 66 per cent as compared with 14 per cent for the previous method. Annual savings resulting are 7000 machine hours, 7000 man hours, and 1600 pounds of material.

In another typical case, a die was designed to draw and punch a brass banding ring from sheet brass instead of cutting brass tubing to length on a screw machine. The sheet brass is much thinner than that of which the tubing was made, and an annual saving of about 1000 pounds of metal is made even tho much is scrapped as trimming in the draw and punch method. In addition, annual savings of 2400 machine hours and 2400 man hours are obtained.

DOWEL PIN PULLER



Two types of dowel pin pullers suggested by workmen are used effectively at General Electric's Schenectady Works.

One, suggested by Francis Barton, has a knurled cylindrical sliding member which serves as a hammer. It slides along a shaft which is threaded at both ends.



12" TOOL ROOM Rotary Table

MANUFACTURED BY INDEX MACHINE & TOOL COMPANY



A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings — hardened and ground worm — quick acting throw-out for free hand turning — single movement table lock that does not cramp table out of alignment — compound trough. 12" size only.

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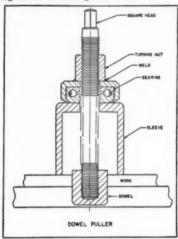
If your oil engineer calculates a five percent oil emulsion for best results, and because of bacterial spoilage only a three percent oil emulsion is actually reaching the work, then the full speed of production may not be realized due to inadequate wetting or cooling.

Your Dolge Service Man, after free testing of samples in Dolge laboratories, can recommend a tailored-to-fit STERIDOL to keep the emulsion clean and sterile... and it won't adversely affect wetting power of coolant. Your coolant then permits regular maintenance of maximum cutting and grinding speeds.

Call your local Dolge Service Man, or write for illustrated booklet.



One end of shaft is fitted with interchangeable heads threaded to fit various sized dowel pins. The other end of shaft is fitted with a turned piece of machine steel which serves as an anvil against which sliding member is pounded to remove dowel. This device can also be used to drive dowel pins into place by reversing action of sliding member.

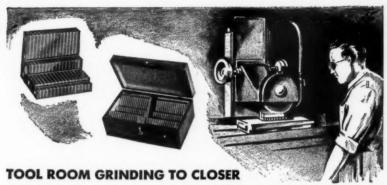


The second dowel pin puller, suggested by Samuel Solini, employs a turning nut into which a ball bearing has been inserted. This eliminates friction between turning nut and sleeve, making it easy to exert a strong and steady force on dowel pin, and reducing wear on working parts.

NEW PLATING TECHNIQUE

Certain copper or brass parts of aircraft instruments that carry high-frequency currents must be corrosion resistant. Electrically, they must have high surface conductivity because of high-frequency current skin effect. Nickel, normally used to provide anti-corrosion protection, has high electrical resistance. In seeking a solution to this problem, Westinghouse engineers turned to gold, which is non-corrosive, satisfactorily conducting, but costly.

Electrochemists finally evolved an answer that disposed of this worry and provided a plating technique valuable in many applications unrelated to the original need. Special plating anodes are made of an alloy of copper, tin, and zinc. With



PRECISION—can be handled with greater speed and convenience with SCHERR TOOL MAKERS ANGLE IRONS

Every good tool maker will welcome these new grinding room specialties because they enable him to hold thin work that cannot be clamped and grind it square with utmost accuracy and speed.

SCHERR TOOL MAKERS ANGLE IRONS, placed on your magnetic chuck, provide magnetic right angles having the same holding power as the chuck itself. A series of steps are available on which a wide variety of thin work may be placed and securely held during grinding operations by

magnetic force without the use of complicated clamps and attachments. By using a sine bar or bevel protractor work requiring grinding at various angles may be laid out and handled. Write for complete detailed information oSCHERR GRINDING ROOM SPECIALTIES which include Magne-Blox Angle Iron, Magne-Blox Laminated Magnetic Parallels and V-Blocks, "Little Wonder" Radius Dresser and other tool room and production tools.

SPECIFICATIONS and PRICES

Single Tool Makers Angle Iron—in hardwood case. Overall dimensions: 3" x 3" x3%". Price \$23.50. Matched Pairs Tool Makers Angle Iron—in hardwood case. Price \$45.





. . . 8 diameters, 4 faces . . .

FOUR FACES-ALL ACES

This magneto-shaft is typical of careful Ace machining. It is cylindrically-ground on 6 different diameters and 4 separate faces, and both faces and diameters must be ground to a 12-16 micro finish.

BELY ON ACE FOR PRECISION ERIMDING Centerless, Internal Cylindrical, External Cylindrical, Blanchard Surface, Plain Surface, and Thread Grinding.

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ACE MANUFACTURING CORPORATION for Precision Parts



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these soluble anodes, copper and brass parts are plated using standard plating practices.

Results are truly amazing, according to company engineers. The plated surface has the necessary electrical conductivity for high-frequency applications and is superior to nickel in corrosion resistance. Further, the finish is mirror-like, being surpassed in this respect only by silver itself. As to abrasion, the surface is roughly twice as good as the usual nickel coating. The new plating is entirely nonmagnetic (not true for nickel) and is easily soldered, a fact of great value in many electrical applications. Furthermore, the new plating process has great "throwing power." In other words, deep interior surfaces (in objects with cavities) are plated much more uniformly than is possible with nickel.

TOOL GRINDING FIXTURE

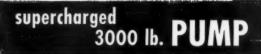
A new model G Universal Tool Bit Fixture for grinding screw machine tool bits has just been developed by Boyar-Schultz Corp., 2108 Walnut St., Chicago (12) Ill.

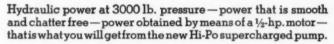


The makers say that with this Fixture on a surface grinder, inexperienced operators can quickly pro duce uniformly ground tool bits for both right and left hand screw machine tools. Any desired chip breaker angle can be ground to suit any type of material or condition.

Settings provide for repeating any de-







It is adaptable to the efficient operation of machine tools, arbor presses, hydraulic cylinders for many types of equipment and for many purposes, such as in the plastic arts, die casting, etc.

This new Hi-Po pump is designed for highest efficiency. It consists of a low-pressure section which supercharges a high pressure section. It is compact, yet all parts are easily accessible. Every material, and every part, used in this pump is selected to give long unfailing service.

Anker-Holth engineers are ready to help with your hydraulic and pneumatic problems—and with no obligation to you.



"Airgrip" Holding Devices will increase the output of your machines more than 25°— and at the same time greatly reduce operator fatigue.

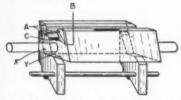
Anker-Holth Mfg. Co.

12.5 Michigan Ave Chicago 1. III

sired angle with the assurance that every bit will be ground exactly the same.

This Fixture saves, not only time in grinding tool bits, but it also saves critical material because less stock is removed in re-grinding. Uniformly ground bits also save machine set-up time.

HOLDING DEVICE



A holding device developed at General Electric's Schenectady Works permits groove milling with a staggered-tooth side-and-face cutter instead of a form cutter.

Milling the groove shown in the attached sketch with a form cutter required a



very heavy cut. The amount of material removed quickly dulled the cutter, necessitating frequent regrinding. Obviously, each time the cutter was reground its dimensions were changed, and a very careful readjustment of the miller was necessary.

A slot the width of "C" is first milled out and surface "C" then milled to desired dimensions. Surface "X" of the locating device is finished to be parallel to proposed surface "A" when the piece is in position. Surface "Y" is at 90 degrees to "X". The V in locating device is cut so that when the piece is in position, the "B" surfaces are vertical and are machined as an end milling operation. The piece is then turned end for end and surfaces "A" are machined in similar manner.

STRESS-STUDY

Not so long ago, research chemists were searching for new plastics, hoping to achieve an electrical insulation with certain properties. In making such an exploration, numerous ingredients in that plastic series had to be tried in different combinations, according to Westinghouse engineers. One of the resulting plastics, not suitable for the insulation problem, did prove valuable for other uses in this case.

Three-dimensional models for photoelastic stress studies are made from the new plastic. After the transparent material is stressed in a realistic manner, the stress lines show up as different colors when observed under polarized light. Heretofore, suitable plastic for such models could be obtained only in small pieces—sheets measured less than 100 square inches and were only 34" thick. Several months to a year were required to cure the old material satisfactorily.

The new plastic has no such limits. Furthermore, it can be made in large pieces. Already produced in the labora-





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SMALLPEICE Machine Tools and Equipment Manu-

tory in sheets measuring 600" square by 3" thick, it can be cured in two days.

Larger and thicker pieces of the photoelastic product will permit stress analysis of large full-scale models. In addition, studies can be made at lower cost than was previously possible.



The illustration shows a transparent plastic model of a crane-hook photographed by means of polarized light, which vibrates in a single plane instead of scattering like ordinary light. Refracted by the stress lines in the model, the light produces interference bands showing the points where greatest load is borne by the hook. In ordinary light, no lines appear in the model.



MEADLESS PRESS FIT HEAD PRESS FIT FIXED RENEWABLE SLIP RENEWABLE HEADLESS LINERS

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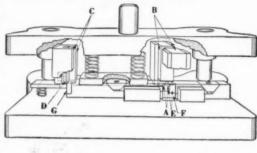


SAVES TIME PRODUCING CHANNEL SECTIONS

A notch and cut-off die devised by E. H. Girardot, tool design foreman at General Electric's Sche-nectady Works, produces a channel metal section in one operation on a punch press, saving time over the old method of cutting to length and straddle - milling the notches on both ends of channel.

Illustration shows the die, a detailed section indicating shearing punch action, and part produced. A combination of shearing and notching punches is utilized in the first die stage for removing metal for the notches on ends of part. Tapered punch inserts "A" shear sides of notch from channel thru their action past

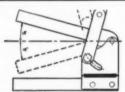
die sections "E", after which solid notch-ing punches "B" complete notching operation at bottom of press stroke.







The second stage carries two pilot blocks "C", which pick up the notches and accurately position part to length



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No other clamp is as flexible in its application -in closed position, the clamping bar has infinite adjustment up to 15° below and above horizontal. Drop forged construction. Write for new 28-page catalog (on your firm letterhead, please).







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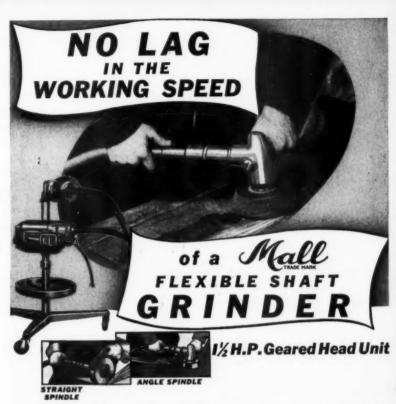
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Every r.p.m. counts for production with this independently powered MALL Grinder that operates at constant high speed under load. The steady flow of power increases the metal cleaning and finishing rate, reduces the wear on abrasives, makes for a finer uniform finish, and cuts rejects.

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before clamping of material and also before any cutting starts. A cut-off punch "D" is mounted between these pilots and cuts off completed blank,

All cutting members are designed to reduce maintenance by facilitating readjustment after grinding. The adapter block "F" is provided with a permanent locating step representing center line of first die stage. Die sections "E" can thus be readily replaced to their proper loca-tions and locked there by means of taper wedges provided. Punch inserts "A" can be removed and reground, then returned to their original cutting position by putting shims behind inserts to take up an amount equal to the metal removed in grinding. Inserted plate "G" in cut-off stage is set up in similar manner after sharpening.

Preliminary stops at each stage and the positive pre-locating stop for final part are not shown on sketch. Completed parts drop into a chute at end of die and are conveyed to tote boxes for handling to subsequent piercing and forming operations.

SPOTTING INVISIBLE FLAWS



The crack in this aluminum piston, invisible under ordinary inspection, stands



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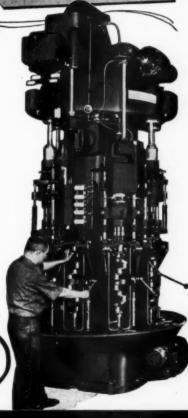
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The
Sommer & Adams Co.
places at your command a
25-year acquaintance with the
intricacies of special machine
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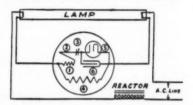
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c/o HITCHCOCK PUBLISHING CO. 542 S. Dearborn St. Chicago 5, III. out sharply as J. A. Sams examines it in the fluorescent test with ultraviolet radiation now being used at General Electric's Schenectady plant. After dipping castings made from nonmagnetic materials such as aluminum, copper, and their alloys into a special preparation, he holds them under an ultraviolet light and defects such as cracks instantly appear. The test can be applied to the inspection of parts for planes, searchlights, and other war products.

STARTER ELIMINATES BLINKING



Fluorescent lamps do not burn out suddenly. Instead, they try to start but are unable to sustain the arc, according to Westinghouse engineers. The result is a periodic flashing of the lamp that continues until lamp is removed or the ciruit is interrupted. Repeated attempts at starting seriously shorten life of the starter.

Company engineers have developed a starter that preheats the cathodes in the usual manner. It also interrupts the circuit when the lamp becomes deactivated or reaches the end of its life. This "no-blink" starter is available for 40-and 100-watt lamps.

It utilizes a simple form of thermal switch in series with the timing switch. When the lamp is in good operating condition, the starter functions normally—it merely provides the time to start the

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No. 606 - 6" cleans and finishes castings, dies, stampings and any other work that is ground. Gives a straight line finish and leaves edges sharp. In addition to tight and loose pulleys, it can be arranged for direct motor drive. Compact, durable, smooth running, with quick easy adjustments. Other belt surfacers and polishers, Tool and Cutter Grinders, Sensitive Drills.

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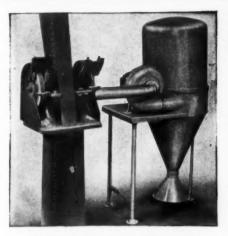
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MACHINE BASES





lamp. When lamp fails, the starter makes a few attempts to put it in operation. The resultant heat brings the thermal switch into play which then permanently opens the lamp circuit. The new device eliminates blinking and reduces current flow thru lamp auxiliaries—this saves power. The starter is fully automatic. When the burned-out lamp is replaced, the starter automatically resumes its normal lamplighting function.

CLOSE TOLERANCES



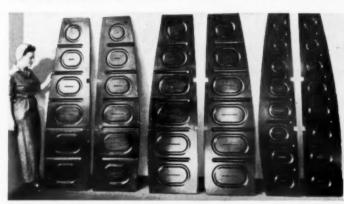
The close tolerances required for war production, even in heavy industry, have made measurements within one tenthousandth of an inch standard practice with both tools and production, as

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Perfect for all types of metal layaut work. Assures cleanly defined lines... greatest accuracy. Special fluids made to your requirements...with color intensity and drying qualities you need.

UNITED AIRCRAFT PARTS MFG. CO.

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These six-foot wing rib dies, used in a hydro press, are made of Masonite Die Stock. Photograph courtesy of Schlenzig Manufacturing Company, Camden, N.J.

ALTHOUGH it's only one-sixth the weight of steel, Masonite Die Stock is proving to many aircraft manufacturers that it can stand up to the toughest jobs.

Even in large dies, you don't have to worry about this material bowing or taking a set after routing for beading and lightening holes. Masonite Die Stock has high compressive and flexural strength. Dies remain flat.

This amazing semi-plastic material can be fabricated in pattern or metal shops in a fraction of the time required for metals . . . stands up under present-day production requirements . . . saves time, money and effort.

Because of their remarkably light weight, dies made of Masonite Die Stock can be easily handled in and out of hydro press or power brakes by either men or women. Hoists and cranes are rarely required.

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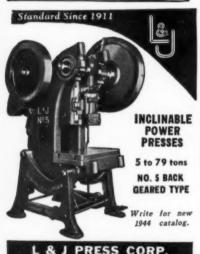
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Send your blue prints or samples for estimates.

PORTER MACHINE COMPANY 3100 Enyart Ave., Oakley, Cincinnati, O. evidenced by the record of Elliot Co., Jeannette, Pa.

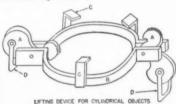
Since ordinary measuring methods are neither close nor flexible enough to guarantee complete accuracy within this limitation, Elliot Co., uses the optical comparator. The measuring machine and comparator projects on a ground glass screen an accurate shadow of a tool or part magnified from 25 to 50 times actual size. With this enlarged image, measurements within one ten-thousandth of an inch can be made accurately and with ease.

The part here being measured has been magnified on the screen to 20 times actual size. Dimensions have been drawn in to illustrate the close tolerances required of this production.

For checking the accuracy of tools, tracing paper drawings to scale may be mounted against the glass screen and the shadow of the tool itself used for comparison. High accuracy photo reproductions of drawings on glass are available for checking in this way. Any worn places or inaccuracies in the tool can be detected quickly by this means.

LIFTING DEVICE

A lifting device for moving cylindrical objects to which it is impossible or impractical to attach cables or eyebolts is saving crane operator and crane follower man-hours at General Electric Company's Schenectady Works.



PRODUCTION



With this 4 Tool
Post Turret on
Your Engine Lathe
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Production Drills

● "Buffalo" Drills make it easier for the operator to turn out precision work—even under emergency speeds. The basic reason for this is the "Buffalo" design-drilling machines "geared" to the men and women who operate them. All controls are located for fast and easy manipulation—with a minimum of muscular fatigue.

"Buffalo" Drills practically "run themselves"
—enabling even unskilled labor to keep up
with production schedule and deliver precision drilled work. The "Buffalo" line includes
a wide range of models and sizes for practically all metal drilling applications. Engineering details on request.

BUFFALO FORGE COMPANY



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DRILLING MACHINES

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected _ save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

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As shown in sketch, the device has two pivoting jaws (A) opposite each other on a ring (B). The jaws function in the manner of a pair of ice longs in that they make the weight of object being lifted exert the force to hold it securely.

Three inverted L-shaped pieces (C) spaced around outside diameter of band. position the device when it is lowered over object to be lifted. Then a crane is attached to clevises (D) on the two jaws, and the subsequent lifting movement pivots the two jaws down and inward so that they hold positioned object firmly.

DETECTING OXYGEN AND WATER VAPOR

Oxygen, if present in heat treating atmospheres for steels, will rob the surface (sometimes even the interior) of carbon. This ruins the surface finish and softens the steel, according to Westinghouse en-gineers. Water vapor at these temperatures also has a detrimental effect since it decomposes into hydrogen and oxygen. Water vapor, under such conditions, also appears to act as a catalyst in aiding decarburization.

Presence of unwanted oxygen and water vapor in heat-treating atmospheres is de-

F" Ball Bearing Centers



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MODERN MACHINE COMPANY BROOKLYN, N. Y. 323 Berry Street



tected by passing the gas over a cool sur-face and by noting the temperature at which condensation occurs. This temperature of condensation (dew point of the gas) varies between -40 and -70 degrees C, depending upon requirements of the process. Even skilled operators differ in their estimates of dew-point temperature. especially when it is of the order of -40 degrees C or lower. Furthermore, the process is not continuous and requires

DIE PRODUCTION SPEEDS



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Modern Automatic Die Stops eliminate speil-age. Cut mounting time to ½-hour. Need no installation skill. Hardened thruout. Try one. Or write for literature.

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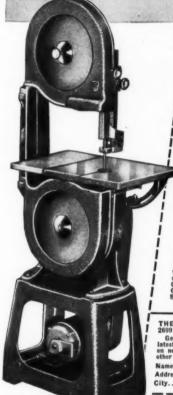


The World's Best Rubberised abrasives for Fine Grinding and Polishing

Attach this advertisement to your card or letterhead. We will send you a free trial sample. Or if you prefer send \$1.00 for Special 33 wheel assortment.

CRATEX MFG. CO., 81 Natoma St., San Francisco, Calif.

A basically improved low-cost Metal Cutting BAND SAW



Despite its unusually low price, this heavy
DURO 16-inch production Metal Cutting Band
Saw has many special features set festing Band
Saw has many special features not festing the
chines costing several times as much. It is ideal
for eutting tubing, extruded shapes, her stocks,
metal sheets, casting gates, plastics, brake linings, hard rubber, slate, fibre and many other
materials. Can be adjusted to obtain standard
wood cutting speeds by a flip of a lever. Some
of its special features include: Heavy machined
cast iron trunnien; special relier blade guides
which reduce blade crystallization and lessen
blade breakage; new design which permits all
sile opporation; New Departure Ball Bearings;
machined dove-tailed ways with adjustable steel
gibs; many other advantages. Metal cutting
speeds; 230 and 596 R.P.M. Wood-cutting speeds;
2300 and 5960 R.P.M. Wood-cutting speeds;

HAS MANY EXCLUSIVE FEATURES

Specification: include: 16" capacity: 10%" capacity under blade: table working surface—23%: 18": 45" table tilt; height of base—19"; height of saw—51"; height from table to floor—41%; wheel diameter—16". Uses 4 New Departure ball bearings, ball bearing blade guides. Has built in light. Blade is fully guarded. Weight of unit as illustrated, but less motor, 405 lbs. Alse available in 15" model.

Send for New DURO Catalog

For full details and prices on the DURO 16" Metai Cutting Band Saw send for latest DURO CATALOG using ecopon below. Also lists specifications and prices of complete line of DURO single and multi-spindle Drill Presses, Circular Saws, Jointers, Routers, Shapera, Grinders, Lathes, Seroll Saws, Flexible Shaft Units and Portable Electric Drills.

THE DURO METAL PRODUCTS COMPANY 2699 N. Kildare Ave., Chicago, Illinois

Gentlemen: Please send me FREE copy of latest DURO Catalog giving full specifications on new DURO 16" Metal Cutting Band Saw and other DURO Machine Tools.

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DURO TOOLS

MACHINE TOOL DIVISION

ALSO MAKERS OF DURO HAND TOOLS

DUMD

SEND FOR BRAND NEW ILLUSTRATED CIRCULAR

ADJUSTABLE KNURL HOLDER









This new circular tells how the Graham Knurl Holder produces many patterns from one set of knurls, and gives details of the amazing variety of work and range of capacities of the several models, handling work up to $2\sqrt{\chi}''$ dia.

Request Illustrated Price Circular.

GRAHAM MFG. CO. 58 Bridge St., East Greenwich, R. I.

WHITNEY- JENSEN PRODUCTS

NEW! NO. 38 BENCH SHEAR

A small, powerful, throatless - type shear with capacity up to 3/16" mild steel. Cam action provides straight up-and-down blade travel. Length of blade 5". Size, overall, 11" x 83", x7½". Weight 45 lbs. All parts interchangeable for easy replacement.



WHITNEY METAL TOOL COMPANY

the operator to take periodic samples of gas to make the test.

An experimental device developed by Westinghouse utilizes electrons to do the detecting. The electrons furnish a con-tinuous report of their findings to the operator. Oxygen and water vapor is ionized by electron bombardment, whereas constituents of furnace gases are not. The arrangement draws a sample of the gas mixture past an electron gun. As long as the gas is free of impurities, the electron current is constant. However, when oxygen or water vapor are mixed with the gas, some of the electrons are utilized in forming negative ions. This causes a measurable decrease in electron current. Most electron tubes are vacuum devices and the tube employed here is essentially a diode tube which operates with both ends open. The electron emitter and the plate continually operate in a stream of hot furnace gases.

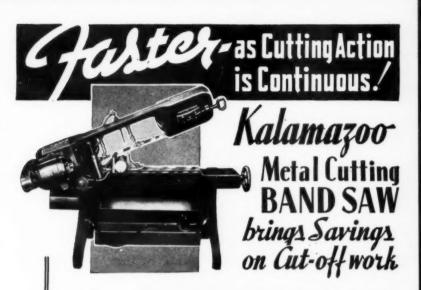
This electronic dew-point indicator removes the difficulty of judging visually determined dew points, a method subject to considerable variation. Furthermore, it provides a continuous indication of gas quality. At present the new development is strictly a laboratory instrument and is not commercially available. Applications of the dew-point indicator will probably be restricted to certain types of furnace

PLASTIC RETAINER RINGS

Retainer rings for ball bearings are scarcely more than guides to hold the steel balls in position. They carry no appreciable load—the balls and races do that. Nevertheless, at high grinder speeds (sometimes 60,000 rpm) retainers assume new importance, according to Westinghouse engineers. They become the limiting feature of allowable load and speed. By using plastic Micarta retainers instead of the conventional steel types, the limitations have been largely overcome.

Micarta retainers have great mechanical strength and are light in weight. Machined accurately by automatic means, they are produced economically of materials less critical than steel or bronze. Rings are rigid yet flexible enough to resist vibration, fatigue and shock. Because Micarta has good wetting qualities, lubricants adhere better and provide quieter operation with less wear.

These plastic retainer rings have withstood tests that prove their ruggedness beyond doubt. Some have undergone 18 billion revolutions on a high-speed grinder. On a similar machine, others have had 15 months of continuous operation. In the latter case, an accuracy of half a tenthousandth was continually maintained.



Why use a large expensive cut-off machine when a small low cost machine does the work faster and more accurately?

PAYS FOR ITSELF in a relatively short period due to — reduced labor cost — smaller first cost — lower maintenance, depreciation and power costs.

Portable — wheel it right to the work — plugs in anywhere. Cuts solids, tubes or irregular shapes.

STANDARD MODEL for dry cutting.

COOLANT MODEL for production cutting.

COOLANT attachment is compact — does not interfere with portability or machine operation — lengthens life of saws and triples production.

Plan Now for after-the-war efficiency. Saving in thousands of modern plants. WRITE FOR BULLETIN.

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FITS Any Make Engine Lathe

Now—make your engine lathe a dual purpose machine, in a few minutes. Here is complete conversion of engine lathes into screw machines, of any size or make. Complete, or all units are sold individually.



Master Collet Chuck — available for all size lathes. Full spindle capacity. Has maximum gripping power with minimum leverage. No parts to wear. No Friction. No heat.

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Double Tool Post Cross Slide — rack and gear feed. Ruggedly constructed. Designed for excessive tool loads.

Turret Attachment—
available for all size and
makes of lathes. Installed
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station turret with automatic stops. Self-indexing
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ALCO TAP HOLDERS

Don't let it be said that you produced too little and too late. Save all the time you can, cut out waste motion and be as efficient in your operations as you know how.



The Alco Tap Holder on your Screw machines will help your set-up man cut corners because this holder RE-QUIRES NO BUSHINGS. The saving in bushing costs alone pays for the tool.



Adjustable floating feature guarantees concentricity of tap with work, insuring perfect threading and increasing tap life. No more broken taps due to misalignment or incorrect tap angle.

Send for catalog showing complete line of Alco Tool Holders.





ALCC CFFFO OLS

THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.

Detroit Office: 908 Stephenson Building Chicago Office: 6219 So. Kenwood Ave., Telephone: Hyde Park 6807

WHAT'S NEW IN METALWORKING

WARNER & SWASEY TAKES OVER BAKEWELL TAPPER

PREPARING for postwar markets, the Warner & Swasey Co., Cleveland, announces pure hase of manufacturing rights for the Bakewell Tapping Machine from the Bakewell Mfg. Co., of Los Angeles.



To be known as the Warner & Swasey precision threading and tapping machine, its production is being transferred to the Company's Cleveland plants and sales will be handled by the same branch offices as handle Warner & Swasey turret lathes.

The precision threading and tapping machine is designed to tap or cut threads at speeds required by mass production

and is capable of holding such threads to what is known as a "Class 5" tolerance. At such, it gives this phase of manufacturing a precision akin to that of watch making.

The machine provides greater precision for tapping operations in a variety of materials. The patented, hardened and ground lead screw controls feed of the tap as it enters the work. Upper portion of the lead screw is a hob having the same pitch threads as the screw itself. Thus the hob cuts into brass guide fingers which are brought into engagement against the lead screw, the fingers being actuated by a solenoid mechanism. Prolonged tap life is assured by a safety clutch, adjustable to the safe torsional resistance of the tap and the type of material used. If the tap becomes dull or if it strikes chips in a blind hole, the cork-inserted disc clutch releases in a split-second and the tapping operation halts immediately.

Perfect threads can be cut in plastics, aluminum and its alloys, magnesium, bronze, nickel, and stainless steels. The precision threading and tapping machine will cut either internal or external threads with equal ease, and right- or left-hand threads as desired. A large number of these machines have been produced and currently are being used by industry to meet Army, Navy, and Air Force requirements.

DEWALT TUBE CUTTING MACHINE

A new Tube Cutting Machine for straight or angle operations on tubes, bars, formed and extruded shapes, ferrous and non-ferrous is announced by DeWalt Products Corp., Lancaster, Pa.

It will handle ferrous metals up to 1/5" wall thickness and heavier non-ferrous cross sections can be cut. Saw blades are used on these operations.



tenance of war material . . . proof of worldwide SHELDON accuracy and dependability.

4242 N. Knox Ave.,

Chicago 21, U.S.A.

Unit with E-type

underneath motor



For straight cut-off only, solid bars up to 1½" diameter can be cut with abrasive wheels. Sections up to 4" can be held in air vise.

The arm carrying motor and roller head assembly will turn about column 360°. This permits cuts at any angle without complicated adjustments. Arm is supported on a sturdy 7" semi-steel column.

An interesting feature is an air actuated vise assembly, designed to permit rotating the entire unit in a 300° arc around vise column with a readily accessible air control valve.

A heavy duty chain and sprocket construction within the arm, with a conveniently located crank, controls movement of roller head and cutter.

Elevating crank handle is easily accessible to operator, permitting quick adjustment of cutter elevation. Collapsible tube crank handle may be moved out of the way when not in use.

Roller head has a total movement of 25" along the length of arm tracks.

The motor yoke assembly permits operator to locate motor and cutter at any angle desired because motor may be tilted from horizontal to vertical position within yoke. Dial plate on motor enables quick locating of motor in yoke for any desired bevel cut. Dial has locating slots at horizontal, 45° and vertical positions for quick, positive location. A clamp is provided for intermediate positions. This same principle is carried out on vise column, where a dial permits location of the vises at any desired angle.

The DeWalt-built totally-enclosed fancooled motor is wound with Formex Fiberglas insulation, has generous overload capacity. Its small diameter provides maximum clearance, permitting use of minimum diameter cutters.

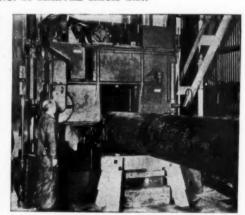
An attractive new bulletin gives specifications and full details.

GIANT NO. 24 MARVEL HACK SAW

The illustration shows a new No. 24 Marvel Universal Hydraulic Roll-Stroke Hack Saw Machine in the plant of the Mesta Mach in e Co., Pittsburgh, Pa., sawing a 22" diameter alloy shaft.

The makers, Armstrong-Blum Mfg. Co., 5700 Blooming-dale Ave., Chicago, 39, Ill., say that this No. 24 is the largest capacity hack saw built. Nominal capacity is 24"x24" and maximum capacity 25"x26". The machine weighs 16,000 lbs. and requires floor space of 56"x122". Extreme height is 151".

The machine was developed to cut off or trim large billet, blocks, and forgings, fast and accurately, retaining all the advantages of the hack sawing method. The makers outline these points as: — low initial





Now you can equip every machine tool for higher production with a compact, portable, low cost Atlas Coolant Pump—screw machines, lathes, drill presses, milling machines, cut-off saws, Cuts tool wear, cuts rejections for poor finish. Powerful centrifugal type pump handles any cutting fluid; flow is adjustable from drip to stream. Two models, universal or induction motor, handling 450 and 225 GPH. Feed lines are durable, tough

extruded plastic. Ask your Atlas distributor for full details about Atlas Coolant Pumps or write us, Ready for immediate delivery,



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LATHES - DRILL PRESSES - ARBOR PRESSES - SHAPERS - MILLING MACHINES

cost; low tool cost; small chip loss; low power consumption; low maintenance,

and simplicity of operation.

The No. 24 saw is similar in design, operating principle, and cutting action, to the Marvel No. 18, which has a capacity of 18"x18". It employs the same low pressure feed, and roll-stroke cutting action. All essential machine parts are fully enclosed and protected against abrasive dust and dirt, as well as rough

usage, incidental to large work.

The No. 24 takes a special blade 36" long, 4½" wide, and ½" thick, with 2½ teeth per inch. This blade is of the "unbreakable" composite Marvel type, employing high speed steel teeth and a tough alloy body.

It is reported that this saw has really solved Mesta's problem of cutting large pieces fast, accurately, and economically.

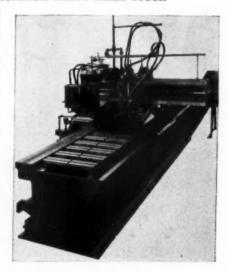
BEVELING FLAT ALUMINUM ALLOY SHEET STOCK

On the production line of one of America's large aircraft manufacturers, there recently appeared as a machine tool "first", a new type of high speed nonferrous milling machine. Its purpose is to mill a long flat bevel on aircraft wing and fuselage sheet stock so that skin sheet sections may be lapped to form a perfectly smooth surface.

and fuscinge sneet stock so that skin sheet sections may be lapped to form a perfectly smooth surface. This A-96 bevel mill was developed and built by the Onsrud Machine Works. Inc., 3908 Palmer St., Chicago (47) Ill. Bevels with surface widths up to 8" may be machined. It is said that surfaces are milled to a mirror finish in a single pass and have been checked and found true-flat to .0001".

Basically, this machine consists of a long bed and T-slot table on which work is held. A carriage travels over the bed to move the cutter head along the work. The bridge arm of the carriage holds two cutter heads, each of which may be tilted up to 15° off perpendicular, in a vertical plane running lengthwise with the bridge arm.

Bevels may be milled on work in two different types of operations, and the



nature of the work, of course, determines which type is employed.



C-master Magnifying Lens

mounted on permanent magnet with adjustable angle device

Models M.L.-1, M.L.-3 and M.L.-4 are specially designed to aid and speed up inspection and assembly of intricate mechanisms. They are powerful, large, handy. Their magnetic base will instantly attach itself to any metallic part of machine and firmly hold the lens at any angle desired.

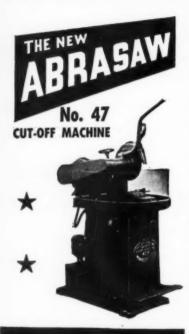
> Sold by leading Mill Suppliers Distributed by Graybar Electric Co.

ULLMAN PRODUCTS CO. BROO

859 Fourth Avenue BROOKLYN 32, N. Y.







This pedestal type machine—improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank in base of machine—with coolant pump at the rear.

Vises can be furnished for straight or combination straight and angle cuts.

Capacity: solids up to 1" tubing up to 2"

Our No. 48W has capacity: solids up to 2½" tubing up to 3½"

Also manufacturers of: KNIFE GRINDERS, FACE GRINDERS, FLOOR GRINDERS, BUFFING and POLISHING LATHES, and ABRASIVE GRINDING WHEELS.

Write for our descriptive literature.

THE BRIDGEPORT SAFETY EMERY WHEEL COMPANY 1304 Broad St., Bridgeport, Conn., U.S.A. For a constant or straight line bevel, work is set up on the table so that the bevel milled will be parallel to the direction the carriage travels, or in other words, parallel to the length of the bed. The bridge arm is positioned to form a 90° angle with the length of the bed and direction of carriage travel.

Cutter heads are set at the angle required to make the bevel. Both cutter heads may be used in one pass if necessary. End mill type or fly cutters may be used for a recommended maximum working diameter of 8". Cutters are directly driven at 3,600 rpm by 15 hp motors. In this type of setup, the carriage is driven over the bed and the bevel is milled as carriage travels over work. On the machine illustrated, with a 15' bed, a bevel up to 10° in length may be milled using one cutter motor, and a bevel up to 78" long may be milled using two cutter motors. This machine is designed to allow bed sections to be added to accommodate beveling of this type to any required length.

For a bevel on a taper or crosswise edge, the work is milled by moving the cutter head in a vertical or untilted position across the bridge arm screw. Work is held in a fixture in a tilted plane to the angle of the bevel required. Bevels of this type can only be as long as motor travel across the bridge arm permits, 30" travel being the maximum for a 90° crosswise edge, and less for the taper edge, depending on angle of taper.

Many unusual features are built into this machine to give precision high speed production. One of the most important is a Centrifugal Bearing Preloader which is responsible for the .0001" machining accuracy of the vertical motor driven end mill cutters. A specially designed Onsrud vacuum chuck is employed to hold work during milling operations.

NORTON INTERNAL GRINDING BOOK

A convenient, small size 64-page handbook entitled—"The ABC of Internal Grinding" has been published recently by the Norton Co., Worcester, 6, Mass. It is of primary interest to operators of internal grinding machines and endeavors to answer some of the practical questions workers have asked. It contains information on how to select the proper wheels for different grinding jobs and how to correct common grinding faults. Included are illustrations of typical jobs and several charts giving data on sizes of wheels for internal grinding.



has performed most successfully for many years in the country's largest manufacturing and industrial plants.

It is designed and constructed for the production of interchangeable parts and for the present day feeds and speeds of modern milling machines. . . It is particularly well adapted to small arms milling, where precision and speed are essential.

For greater strength, solidity during operations, and lightning speed the "Vise with the one piece solid forged movable jaw" is your answer for production.

SEND FOR CIRCULAR

THE HARTFORD Special Machinery Co. Hartford 5, Connecticut

ELECTROLIMIT INTERNAL COMPARATORS

Several forms of Electrolimit internal comparators are described in an attractive, new 20-page bulletin recently issued by Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn. Each is a precision instrument for accurately inspecting holes for diameter, roundness, taper and "bellmouth". All use the same

can check parts as they are finished. Ot course, they are used to decided advantage in regular inspection departments. Women use the gages readily and make excellent inspectors.

The electrical parts of the equipment are made by General Electric Co. The combination of electrical parts and mechanical application is engineered and produced by Pratt & Whitney.



basic Electrolimit principle, combining mechanical gaging with electrical magnification. The comparator is set to the desired size by a master standard. Then when a part is inserted, any error over or under the master size produces a movement in the gaging spindle. This movement changes the balance of an electric circuit, which in turn, shows up as a pointer moves on a meter. The coils in the circuit provide the magnification, so that errors of "tenths" (or hundredths" if desired) produce a large, easily read movement of the pointer. This method eliminates the human element and provides new standards in precision measurement.

The comparators take many forms and are used to inspect a wide range of jobs. Several of the applications are illustrated but there are many more. The design of each gage is quite flexible to allow for small detail changes, adapting it exactly for a specific job. Gages may be changed over from one job to another with minimum trouble. They are used in shops right by the machines, where operators

An outstanding example of the use of Model E gages is in the inspection of connecting rods. The rods shown are parts of a famous liquid cooled aircraft engine for American fighting planes. Batteries of the gages check the rod bearings with the same high precision employed in their manufacture, and the job is done rapidly. Without equipment of this kind, gaging of these rods would be much slower and the frequent expensive replacement of plug gages would be necessary. Left to right, the view shows gaging forked rod main bearing; gaging piston pin; gaging blade rod main bearing, and gaging blade rod piston pin.

Another interesting application is in the Model V bench type gage with a range of adjustment from 1½ to 9" without use of extra spindles. This instrument is especially suitable for gaging various bearing bores, motor end shields, bearing brackets, and parts of like nature. Its wide range of adjustability makes it an excellent all-around instrument for final inspection. It is also widely used on the production line, in close proximity to

PART NUMBERS



MODEL 175

LETTERING

GRADUATIONS

ROLLED

BY MACHINE

ON

FLAT & ROUND SURFACES

Sure - Fast - Accurate

OBSOLETES HAND STAMPING

SAVES PARTS LABOR STAMPS

Eliminates POOR MARKING ERROR — NOISE

Speeds . . DELIVERIES

ALSO ADAPTED TO CERTAIN KNURLING OPERATIONS

This Hydraulic Machine will mark piece parts quickly and accurately. It is serving in the war effort in many plants for marking components of guns, tanks, planes, motors, engines, shells, and practically every metal part produced for war equipment. Machine will mark unlimited number of sizes and shapes when equipped with proper tools and fixtures. It will also do an excellent knurling job on solids and shells of small diameters.

Designed and Built By

GEO. T. SCHMIDT, INC.

1802 BELLE PLAINE AVENUE CHICAGO 13. ILLINOIS



the machines. There it aids in setting up work to close precision standards and enables operators to check work in progress.

WAR or POST-WAR

Production Capacity

We are now in position to take on some additional work. Our plant is ultra-modern with finest equipment. Our staff has had more than 34 years of experience in management, engineering, designing and production—skilled in handling war contracts for large firms—quickly and efficiently.

SEND BLUEPRINTS FOR QUOTATION

Use Our Complete and Modern
DESIGNING, ENGINEERING, DRAFTING
and INSPECTION Service and Equipment

DEFIANCE METAL PRODUCTS COMPANY

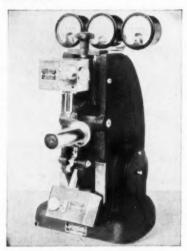
Contract Die and Tool Work

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Zachrich Bldg., Defiance, Ohio

Telephone 170

A further interesting development is the Multiple Station Comparator. This is a combination gage which checks internal diameters and also gives readings on concentricity, squareness of face, and taper as well.



The gage shown gives three readings at once. It shows at a glance, the internal diameter of a part, the concentricity of I. D. and O. D. and the squareness of the face with I. D.—all to a "tenth". With gages like this on the production line or in the inspection department, it is easy to maintain high standards of precision and interchangeability.

The bulletin includes a great many pictures and is an interesting handbook on high precision methods and measurements

MOLDING PRESS BULLETIN

Hydraulic Plastic Molding Presses is the name of a new bulletin (No. 5,000) recently issued by Elmes Engineering Works, 244 N. Morgan St., Chicago, 7, Ill. It describes the presses used for compression and transfer molding processes; namely, (1) the hand molding press, (2) the semi-automatic press, and (3) the transfer molding press. It describes the controls of these presses, their sources of power, and their construction. Cross-section illustrations of press operations are shown; also photographs of the three types of press construction.



TRU-THREAD tools embody a radically new idea in the manner in which the diamond is used. This new idea employs the natural hardness of the uncut stone to achieve accuracy, speed, durability and economy that are truly remarkable.

TRU-THREAD tools cut faster and forms are obtained more quickly. They cut cleaner, leaving the grits sharp and the grain open, creating a free-cutting wheel that holds its form longer. Down-time is reduced, fewer dressings are needed and many more pieces are ground between dressings. Production boosts have gone as high as 500%—and grinding cost per piece has dropped as much as 75%.

There is a TRU-THREAD tool made to dress any form—straight line, radial or multiple and each with equal accuracy—the accuracy that is engineered into them in our plant.

These new tools are now being made and reserviced on a production basis, assuring you fast deliveries. Write, wire or phone.

LAMSON
DALZEN
and other thread
grinders

*
For forming
wheels that grind
WHITWORTH

For use on

EX-CELL-O

IONES &

WHITWORTH BUTTRESS ACME U S S and any special

form groove or standard thread.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Ave.

Detroit 6, Michigan

DOUBLE CUT ANGLE IRON SHEAR

A new No. 162 ball bearing double cut Angle Iron Shear has been developed by the Whitney Metal Tool Co., 115 Forbes St., Rockford, Ill. It is easy to operate and there is no distortion.



The capacity is given as $3x3x\frac{1}{4}$ angle iron. Net weight is 135 lbs; height overall is 21" and width overall is 12".

The shear operates in a manner similar to the action of this company's ball bearing screw action punches. All sizes of angles up and thru the capacity cited, can be cut by one man without distortion of either leg of the angle iron.



The tool is illustrated in a new bulletin which also shows the No. 38 Throatless Bench Shear. With a capacity up to 3/16" mild steel. The blade is 5" long; overall



Commercial Sets

Danly

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Means Greate Accuracy In Your Production

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Ducommun Metals & Supply Co.
Los Angeles • San Francisco

DANLY PRECISION SETS



MORE CUTS PER DOLLAR

from Specials

ALL TYPES AND SIZES— FROM A TINY REAMER GROUND FROM THE SOLID TO A MASSIVE GANG OF MILLING

CUTTERS. SEND YOUR PRINTS TO





HEADQUARTERS FOR SPECIAL CUTTING TOOLS

We have modern machinery and equipment, modern methods, trained operators and the "Know How" to turn out special cutting tools that meet your requirements in accuracy, precision and workmanship. Send us your immediate needs for prompt inquiries. Bulletin on request.

AMERICAN CUTTER & ENGINEERING CORP., 31741 MOUND ROAD, WARREN, MICH.

AMERICAN CUTTER

AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOKS TO YOUR PAINTS

length is 11"; height overall is 8¾"; width overall is 7½", and net weight is 45 lbs. The shear can be used to slit sheets and cut off flats and the makers emphasize that it is easily operated and durable.

PREHEATING TRAY

A six-socket preheating tray, provided for use with a tube tester, is saving inspection time at General Electric's West Lynn Works. Suggested by Miss Margaret McCarthy, who was awarded \$100 for her idea, the tray eliminates a one-minute waiting period per tube. Previously,





High Speed Heat in 20 Minutes

"Electroblast" Muffle Furnace; no scaling or decarburising, at 7c per hour. Opening, 7"x3½"x2½". \$70 complete with portable blower (pyrometer extra). Also a larger Furnace 7"x4½"x3½".

STARK TOOL CO., Waltham, Mass.

Originators of the American Bench Lathe



the tubes had to be allowed to heat up in the tester for that amount of time before accurate tests could be made. In the illustration, Miss McCarthy is taking a tube from the tray, beneath her left hand, preparatory to placing it on the testing board.

BEATTY JOGGLING PRESS

Beatty Machine & Mfg. Co., Hammond, Indiana, announce a new, integrally built hydraulic press. It is entirely self-contained, and is for joggling plates and shapes, heavy forming and bending in shipyards, car shops, tank shops, and for bridges and structural jobs. Specifications include the following:—Stroke, 36"; advance speed, 13" per min.; pressing, speed, 12" per min.; operating pressure (maximum), 2000 lbs psi; table, 54x84"; top platen 36x36".

The machine is arranged for hand or foot control of the ram movement, and is built in capacities from five to 350 tons.

C-master Magnetic Support Model D-1

for dial test indicators and other uses

Its handy, powerful magnet will hold the dial indicator in any position necessary, will not slide from vibrations of machine, and has sufficient magnetic strength to last for years. The rod is non-magnetic. It will therefore not influence indicator or any part of machine.

Sold by leading Mill Suppliers
Distributed by Graybar Electric Co.

ULLMAN PRODUCTS CO. 859 Fourth Ave., Brooklyn 32, N.Y.





MACHINE CO.

Los Angeles 15, Culiforni



Genuine Grobet Precision Swiss Files are world famous for utmost precision and durability sinco 1812. Learn more about these chrome steel files — send for Cat-

alog WS, the most complete of its kind.

5000 SHAPES and SIZES
FOR EVERY PURPOSE

GROBET FILE CO. OF AMERICA 421 Canal St. New York 13, N. Y.

THE MILLIONTH COMMUTATOR

The millionth commutator for radio equipment used in Uncle Sam's warplanes, tanks and jeeps recently rolled off the production line of Westinghouse Electric & Mfg. Co., Mansfield, Ohio.

Swinging into the production of this vital electrical part 16 months ago after a quarter-century of appliance manufacture, the Mansfield plant now has turned out enough thimble-sized commutators to make a column 10 times as high as the Washington monument.

Consisting of 109 segments of copper, steel, plastic and mica, a commutator is the automatic timing switch of a device called a dynamotor which supplies electric current to operate military aircraft transmitters and receivers.

C. L. Van Derau, Westinghouse works manager, points out that the job of changing from refrigerator and range production to manufacture of commutators created many problems which were solved, one by one.

For example, it took a lot of experimenting to perfect a way to make paperthin strips of copper that are perfectly flat and check to dimensions that vary less than a thousandth of an inch. A Company engineer, Larry Bergstrom, fi-



nally solved the problem by adapting a machine formerly used to cut wire for refrigerator racks.

F & H SLIDING THREE PIN-DRIVE FLOATING TOOL HOLDER Automatically compensates for Machine "IT ALWAYS SLIDES"

Automatically compensates for Machine Spindle Mis-Alignment

Reduces Tool Costs Reduces Scrap
Increases Production

Much setup time is wasted and many parts scrapped trying to produce uniform, accurately tapped and reamed heles on machines with spindles out of alignment with the work. Many die head chasers and taps are condemned for this reason. Many holes are reamed belt-mouthed or oversize. An F & H Manufacturing Co. Floating Tool Holder will eliminate these troublestry one on your most difficult job. Write TODAY for full details.





Prompt Deliveries Capacity 10" x 18", Hydraulic Controls Constant Feed, 1/2 H.P. Motor

OHNSON CUT-OFF BANDSAW

Metal sawing is a more efficient operation with the Johnson Saw. Designed for quick set-up; adaptable to practically every kind of cutting job. 3-point base for anchorage on uneven flooring.

Write today for descriptive folder to Sales Office:

OHNSON MFG. CORP. 5000 CHRYSLER BLDG.

Cutting

Coated Abrasive Belts & Discs IN STOCK FOR IMMEDIATE DELIVERY

These Popular Sixes Available in All Grains

BELTS		DISCS
1x42" 4x36 4x36¼ 4x52½	6x48" 6x48 1 6 6x54 1/2 8x61	12" 14 15

Other sizes available for 2 week delivery from receipt of order, including waterproof type belts.

Complete Stock rolls, sheets, fibre combination discs.

Order Today

WALLS SALES CORP.

96 Warren St. New York, N. Y.

LUBRICATION TROUBLES?

RICTION COMPOUND



Packed in 5-10-25-50-100 lb. Containers

Here is a tried and proved product will cool hot bearings . . . solve your toughest lubricating problems.

By simply mixing a little Motor Mica with your heavy oils or greases as directed, lubricating properties will be greatly increased. Saves wear on bearings, gears and other moving parts.

Works Wonders with Cutting Oils Added to etting oils Moter Mica saves tools and produces cleaner, smoother surfaces. Gives cleaner draws and reduces upkeep on dies for deepdrawing and punch press operations. A little goes a long way. America's largest industries use Moter Mica regularly.

QUICK SHIPMENTS

Write — Wire — Phone your Order teday?

SCIENTIFIC LUBRICANTS CO.

\$469 N. Clark St. Est. 1914 Chicago, III.

Another tough job was development of an inspection method to make sure that the copper and mica strips were assembled absolutely parallel in commutators. This was necessary because a slanted strip could create static that would interfere with radio reception in a warplane, tank or jeep.

Westinghouse found the answer in an inspection device containing a light bulb, two mirrors and four magnifying lenses. Known as a comparator, the instrument magnifies the image of a commutator's surface 22 times normal size and throws the reflection on a glass screen. Women inspectors quickly and accurately check alignment of copper and mica strips by comparing the image with vertical lines painted on the screen.

By means of this inspection device, once used to examine thermostats for electric ranges, Westinghouse was able to step up production of commutators 20 per cent and cut their cost a tenth. In addition, women inspectors no longer complain of headaches that had accompanied the old magnifying glass inspection method. The manufacture of commutators involves more than 20 steps performed by men and women who in peacetime build electric appliances for homes.



"IT'S A RAFFLE, THE WINNER GETS A SEAT ON THE BUS IN THE MORNING!"



ALL STANDARD SIZES

National Fine — National Coarse 0-80 to 1½-6

> Also Pipe Plug Gages 1/4





WHEN you need standard Thread Plug Gages in a hurry, wire us and the sizes you require will be on their way to you within 24 hours. In fact, in case of emergency, the shipment can be ready to leave from the near-by Detroit airport within an hour of the time your order is received.

CADILLAC GAGE COMPANY

Our entire manufacturing facilities are devoted to the production of thread plug and ring gages. This accounts not only for our speedy service, but also for the high quality and precision workmanship that are the result of specialization in this particular field.

TWO SONS IN SERVICE -A personal as well as a patriotic interest motivates John J. Paul in turning out fine jobs at the Naval Ordnance Plant in Louisville, Ky. One of Mr. Paul's sons is in the Navy, another is in the Army. The operator is shown milling a bevel on the breech face of a 5" anti-aircraft gun being manufactured at the Plant, operated for the Navy by the Westinghouse Electric & Mfg. Co.



METAL CUTTING LUBRICATION

An attractive new 32 page bulletin is offered by Cities Service Oil Co., 60 Wall Tower, New York, N. Y. The preface outlines the purpose of the bulletin, stressing

MASCOT SLIDE

Fits the pecket. Quirkly solves any problem in multiplication, division, proportion. Gives the aquare, the square reot, logarithm and reciprocals of all numbers. Trig scales give since and tangents of numbers. Fine black graduations on white celluloid, Price in Tabricold case \$1.00, in leather cast \$91.25, money back if not made dealing. and dealers.



TAVELLA SALES CO. 25-DB West Broadway, New York 7, N. Y.

the importance of machining fluids in modern working operations. Employment of suitable oils has made economically feasible the machining of newly developed tough, stringy alloy steels not other-wise possible. Further, it has permitted increased production at lower cost, at the same time improving finish, tool life, etc. on these and other metals in a variety of machine operations.

Briefly, the bulletin discusses studies in metal cutting; friction and its relation to chip formation; "addition agents" in cutting oils; the built up edge; fundamental processes in metal cutting operations, and metal cutting fluids in practice.

There are numerous illustrations and a very illuminating discussion of the desirable points and qualities of cutting fluids and tips on selecting the right fluid for the job.

Copies will be mailed gratis on request.

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

Save on Small Drills Use the Hamilton



You Can't Afford Slips When Drilling Tiny Holes

That's why the Hamilton does such a swell job . . amazingly accurate, precision drilling of holes from .004 to 5/16" diameter.

HAMILTON TOOL

Ninth and Hanover Streets. OHIO HAMILTON

STOP DUST

from ALL Abrasive Operations

Entirely Self-contained. Motor, fan, cyclone separator and filter. Fast installation. Flexible metal hose permits installation complete in minutes.

Compact and Portable. Even the biggest DUSTKOPS will usually fit in the existing space behind or beside the grinder.

Send now for complete information. To save time, describe the source of the dust when you write.

AGET-DETROIT CO.

605 First National Bldg., Ann Arbor, Mich. Detroit Office: CAdillac 3090—Zone 26



For smallest grinders, laboratory work.





"READY TO GO" this model is for medium duty work of all kinds.



Ideal for light duty production surface grinding.

MODEL 1250 has a tyclone separator.



Handles all the dust from this armor grinding job easily.

Four wheels exhaust into a single Model 1250 that gets all the dust.

NOBUR REFINEMENTS

A new feature announced by the Nobur Mfg. Co., 908 N. Orange Dr., Los Angeles, is that all the ir burr removing and chamfering tools are now being manufactured with pilot shafts hard chrome plated.

The tool is simple in construction and operation and helps to eliminate slow and costly hand methods of burring around holes. Used in a drill press, lathe or other machine spindle, the tool is kept in continuous motion while parts are fed to it

WIRE ROPE CUTTER



Lewthweite No. C

Hand Power

Lever Action

Weight 110 lbs.

Price \$80.00

Immediate Shipment from New York Stock.

The compactness and durability of this tool make it particularly adaptable for

shipyard or field work.

T. H. LEWTHWAITE MACHINE CO.
311 East 47th St., New York 17, N.Y.



as fast as the operator can handle them.

The tool comprises a cylindrical shaft which pilots in the hole to be de-burred to one end of the shaft is fastened a knurled collar. This collar is a free-rolling ball bearing unit that can be grasped and held by the hand even while shaft is rotating. By sliding the collar up or down, the burring blade may be advanced into cutting position or withdrawn.

According to the manufacturer, this hard chrome treatment definitely increases life of the shaft and presents a surface that is resistant to the wear of various abrasive and hard materials upon which Nobur tools are widely used thruout the aircraft industry.

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for holting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

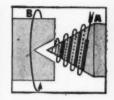
is. 48, 10° jams, 2½ ° deep, opens 8½ °. Weight 125 lbs....\$52,00 No. 4, 6° jams, 1½ ° deep, opens 5°. Weight 45 lbs.....\$38.00 Our complete line includes Vises for Drill Pressen, Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago. Write for illustrated older today. Dealers inquiries solicited.

J. E. Plunket Machine Co. 1823 W. Lake St.



HEAD STOCK CENTERS



For fast service on replacements, order centers from CMD. The famous CMD Helical Groove Centers for tail stock has an exclusive helical groove which constantly conveys a supply of oil to the extreme point of the center. This unique design assures better lubrication, longer running time and greater machine output. Order CMD Centers today.

Now Available IMMEDIATE DELIVERY!

Write for FREE Sample Kit

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CHICAGO	MANUFACTURING & DISTRIBUTING	COMPANY
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Dept. 2BB, 1928 West 46th St., Chicago, III. Send circular on CMD Helical Groove Centers.

Sena circular on CMD relical Grove Centers.

Without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

FIRM NAME .

ADDDDCC

ANDERSON STRAIGHTENING PRESS

A sensitive, high speed, hydraulic straightening press is being manufactured by Anderson Bros. Mfg. Co., Rockford, Ill.

Capacity of the machine is 10 tons: vet is said to be so sensitive a shaft may be bent as little as .001". With this press, it is possible to apply the exact load required to correct shaft run-out.

The pressure gauge indicating ram loading, is mounted conveniently near work at eye level. Beneath ram, at point of maximum deflection of work piece is located an adjustable dial indicator. This shows amount of shaft run-out in the pre-loaded, fully loaded, and unloaded positions.

Use of a Barnes Hydraulic system on this press is said to provide four distinct advantages over conventional types.

First, flexible, sensitive control of press is made possible by a unique rotary control valve. This is operated from front of machine by a control lever which, when depressed, causes a corresponding increase in load applied. An infinite range of loading up to capacity is obtainable as lever is moved from 0 to maximum displacement. Push button control of hy-



draulic unit is provided for starting and stopping, altho, no load can be applied until lever is depressed.

Second, safe operation is assured by use of a spring return mechanism on control lever. Release of lever reduces load immediately and causes ram to return rapid-

Third, a high rate of production is attainable because of rapid ram return speed.

Fouth, ease of operation is assured since operator has complete control of press simply by use of control lever

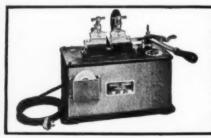
Length of work table is 60". Available table attachments include checking rolls, spring loaded centers, and adjustable anvils. To further aid production speed, an adjustable stop collar is provided which may be used to limit the 6" maximum stroke of the ram. Hand operated control equipment is standard but extra provision can be made for foot operation.





No guesswork—bearing failures -waste-idle machine timeoil-soaked motor windingsfire and accident hazards, when you modernize with TRICO OILERS. There's a type for every application.

WRITE FOR BULLETINS.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working The No. 141 sence 1ype meta working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to 3/4" wide may be welded. 220 and 110 Volt, 60 Cycle, single phase, 5 point heat control, 1 point anneal heat. Shipping weight 79 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt. Scam, Flash, Projection and Special Welders.

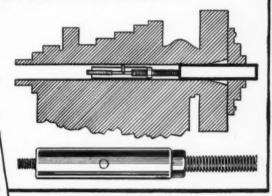
WELDEX INC. DETROIT WAS AVE.

CARLSON Spindle LATHE STOP

The Carlson Spindle Lathe Stop is designed to speed up and simplify lathe operation, especially in machining parts on a mass production schedule. When placed at correct position in spindle for first part, it automatically provides permanent set-up for remaining parts to be machined to same dimensions, regardless of quantity. The Stop can be placed anywhere within the spindle. It is fitted with an adjustable screw which can be extended out in center of chuck jaws when chuck is needed for working on small parts.

- · SPEEDS OUTPUT
- REDUCES REJECTS
- . SAVES SET-UP TIME
- . ASSURES ACCURACY
- REQUIRES ONLY
 SEMI-SKILLED LABOR

The Carlson Spindle Lather The Carlson Spindle Lather Stop can be installed in a few minutes. When order the card model of lather also and model of lather also specify inside diameter of lather spindle.



MODEL No. 101 — Inside diameter ¾-inch fits South Bend, Logan, Atlas, Sheldon, and other make benchtype lathes. PRICES ON OTHER SIZES FURNISHED ON REQUEST **5**95

DEALERS' INQUIRIES INVITED

SCHULTZ & ANDERSON CO.

111 EDISON PLACE, NEWARK 5, N. J.

MANUFACTURED BY GREENFIELD MACHINE & TOOL WORKS

The Bendix Vernier Caliper

(A Lafayette Tool)
TOTAL LENGTH: 8 INCHES

MEASURING CAPACITY 5% In.

MEASURING CAPACITY 5% In.

4 Measurements: Outside, Inside,
Depth, and Depth of Threads.

SCALES: 1/16 with Vernier: 1/128 in. .025 in. with Vernier: 1/1000 in.

Net Price \$10.75

HARDENED MODEL Net Price \$16.00

LAFAYETTE TOOL & SUPPLY CO.

178 LAFAYETTE ST.

NEW YORK, N. Y.

EXCELSIOR NO. 10

A new Reversible Shear, Punch and Press designated as No. 10, has been developed by Excelsior Tool & Machine Co., East St. Louis, Ill.

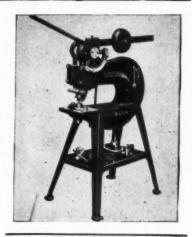
The machine is equipped as shown with shear heads adjustable with wheel screw clamp to any angle; punch and die holders with stripper; six punches, three dies, body tie bolt and two wrenches.

The machine will be found especially useful in large production plants, providing the necessary accommodations for completing patterns, jigs, templates, samples, etc. It eliminates many expensive dies and the readjustment of standard production machines generally used for such purposes.

The machine is likewise adaptable to do job shops where sheet metal is fabricated, involving the punching of holes or shearing openings in any location to the center of 42" in sheets up to No. 12 gauge.

Many jobs can be entirely completed, on stove, range, sign, store equipment or architectural work which would otherwise require three separate machines.

The machine is especially sturdy in construction and capable of standing up in hard service.



This is EVERYONE'S war!
Don't let our boys fight alone!
Back them up with WAR BONDS

-AS MANY AS WE CAN BUY!

Plain Type

AUTOM

MARK

Offset Type

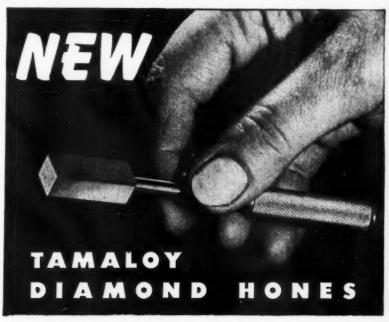
CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO. SPECIFICATIONS:
Open Width ½" to 6"
Gge Material .040 to .125
Pin Diameter .101 to %
Lengths to 120"

THREE-FOURTHS OFFSET.

2326 S. CANAL ST CHICAGO . EMI-OFFSET



- Tools easily honed kept highly polished — before each shift or with tool in machine — cuts down on carbide-tool grinding.
- Keeping tools sharp saves set-up time in changing to new tools, speeds machine output and reduces work spoilage.
- Tamaloy Hones are longlasting. Diamonds set in tungsten carbide resist wear. Carbide matrix prevents diamonds from falling out when rubbed against hard surface or edge.
- Supplied in three grades rough, medium and fine or 100, 150 and 200 grit.
- Ask for prices and other details.

TUNGSTEN ALLOY MFG.

45 COLDEN STREET, NEWARK, N. J. formerly Circle Pip Tool Co.

FLEETWELD "37"

A new general purpose arc welding electrode for welding mild steel in all positions, with either a-c or d-c is announced by The Lincoln Electric Co., Cleveland, Ohio.

The new electrode, named "Fleetweld 37" is the most recent addition to the well-known "Fleetweld" group of Lin-

coln electrodes.

"Fleetweld 37" was originally designed as an easy striking, unusually smooth operating electrode primarily for light gauge material. Extensive use in pro-



ARCRAFT
SPECIALTIES
Precision made (and we do mean "precision") from 36" to 4" Hub Diam. to Army, Navy, Air Corps. spec. AN-40236 ready to install, or to customer's specifications. Write, wire for catalog, data, etc.

MANUFACTURING COMPANY 3447 E. Pico Bl., Los Angeles 23, Cal.

PROMPT DELIVERY! LOW PRIORITY! On This LEWIS 10" Metal Shaper

COMPLETE THIS SHAPER IN YOUR OWN SHOP, using Lewis Castings, Materials and Construction Blueprints, Either rough or semi-finished cast-ings can be shipped immedi-ately-AND ON LOW PRIORITY!

Check the features of this low-cost production tool. useful for all small shaping jobs: Head swivels 60° each side of vertical . . . Table swivels 96° each side of zero and is keyed for normal setting . . Ram is rigidly supported and fully adjustable for stroke . . glbs provided



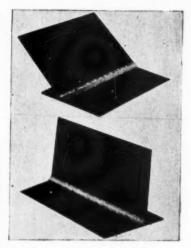
on all sliding surfaces Five automatic cross-feeds adjustable in steps of ,002". Send for free catalog describing the comline.

MACHINE TOOL CO

Dept. Z37

Write today!

P. O. Box 116, Sta. A, Los Angeles 31, Calif.



duction has also shown it to be a very fast operating electrode under all conditions .

A feature of the new electrode emphasized by the makers, is that there is no slag interference when welding "vertical down". This means excellent results are achieved in this position, the one in which greatest welding speeds on 8 to 16 gauge steel are obtained. The illustration show Lap and Fillet or Tee joints welded

with the new electrodes.

Ability of "Fleetweld 37" to withstand higher currents, both a-c and d-c permits higher welding speeds than normal, and its easy handling characteristics in all positions adapt it for general purpose work. The fact that with proper currents it will neither stick to the work nor burn thru makes the electrode especially

desirable for light gauge welding.
"Fleetweld 37" has unusual physical properties for this type of electrode. The physical properties of all weld metal

specimens are:

Tensile Strength.....70,000 to 80,000 psi. Yield Strength.......60,000 to 68,000 psi. Ductility (El. in 2")............18 to 25%

"Fleetweld 37" conforms to American Welding Society classifications for arc welding electrodes E-6012, E-6013, E-7011 and E-7012.

The new electrode is available in the 1/4", 5/32" and 3/16" sizes in 14" lengths and is packed in 50 pound standard containers.

Don't let this Cut-off Blade

fool you - - It can

be used on Your'

Specially designed holders are available for all standard makes

Are you one who has said "I can't use this blade. How could I put it on my machine?" Mister, you have been missing something! Don't deprive yourself of the advantages of this cutting-off blade another day. Convert down time into productive time.

Here's Why EMPIRE TOOL COMPANY'S AND CUTTING-OFF BLADES and HOLDERS are increasing production in leading plants of the country

BLADES

T-shaped design provides proper clearances where necessary, eliminating excessive friction.

Two types available—parallel (Pseries) or lapered (T-series) to longitudinal cutting width, Paallel blade is used mostly for shallow cut-offs and grooving tapered type provides hack clearance bull length of blade and slimbashes accessive friction.

Hollow-ground top causes chip to collapse and relieve friction against sidewalls.

Collapse of chip permits coolant to reach cutting edge of blade. Friction reduced: life of blade extended.

*Blades and Holders can be used an following machines: Acmo Gridley Libby

Midland

Morey

Milliolland

Hattenal Arms

New Britain Automatics

South Bend

Simmons

Acme Gridley
Bardons & Olives
Brown & Sharpe
Cleveland B
Vertical
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Come Automatiq Devenpost Foster Glaholt Greenless Gridleys

stdleys Warner & Sweepy Send for complete catalog.

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND INCLEEPE UNIER LICENSE SESSED BY JOHN MILTON LUERS FATENTS, CM.



HOLDERS

ACCESSIBILITY — Blade can be easily removed for resharpening and replaced without disturbing original setup.

DURABILITY—Holders are made of finest nickel steel, Came of chrome nickel.

ECOHOMY—Nolders continue to grip blades until their size is reduced to within an inch of gripinal beauth.

EFFICIENCY—Holders give blades proper rake to produce free cutting action. Eliminate hand grinding of lip on top of blade.

RIGIDITY—Two developed cams grip blade so securely no chalter or vibration are possible.

SIMPLICITY -- Holders adaptable to machines without requiring alterations to machine or tools.

BUY WAR BONDS

The Blades That Reduce Friction EMPIRE Tool Co.

8782 Grinnell Ave. Detroit 13, Mich.

CARBOLOY REDUCES PRICES

As a result of additional manufacturing economies in mass production of standard single point tools Carboloy Co., Inc., 11139 E. 8-Mile Road, Detroit, Mich., has once more reduced prices on its standard line of cemented carbide tools.

Many of the economies effected, according to Carboloy officials, are directly traceable to the rapidly increasing useage of cemented carbide as a general purpose cutting tool material for all types of machining operations. This has enabled development of a considerable amount of single-purpose production machinery for increased quantity manufacture of standard tools.

With the latest reductions, prices of Carboloy Cemented Carbide standard cutting tools are generally comparable with those of virtually any cutting tool ma-terial, it is said.

The reductions affect grades both for steel cutting and for machining non-ferrous metals, cast-iron, and non-metal-

Addition of grade 78-C to the standard tool line for sizes of 3/4" or more is announced at the same time. This gradedesigned for machining steel parts on

large heavy duty machines—is exceptionally tough and shock resistant and is particularly effective for interrupted cutting of steels. Other changes include lengthening of shanks on 14 standard tool sizes and—to conform with recently proposed WPB standards—minor revisions in a few tip dimensions.

PIPE AND TUBE RENDING HANDROCK

A complete and informative manual and technical book on pipe and tube bending has recently been published bby Copper & Brass Research Ass'n., 420 Lexington Ave., New York, 17, N. Y. Contents include chapters on "Use of Fil-Contents include enapters on Use of Fin-ling Materials", "Pipe and Tube Bending Methods and Devices", "Typical Bending Equipment", "Wrinkle-Bending Non-Fer-rous Pipe and Tube", "Typical Pipe Bending Operations", and "Physical Prop-erties of Copper". These subbjects are well illustrated with detailed pictures showing actual operations. A number of handy and convenient reference charts on weights of tubes and rods complete the booklet.



Determine Surface Flatness to Millionths of an inch with

* Deviations from absolute flatness can be quickly and easily de-termined in millionths with the aid of Acme Optical Flats and Monochromatic Lamp.

Illustration shows interference bands reflected from a truly flat surface as they are seen through an Acme Optical Flat. The straightness of the

ACME

OPTICAL FLATS



bands determines the flatness of the surface.

Our new booklet, "Shop Measurements to one millionth of an inch," describes in simple detail how light waves are used to measure in micro-inches. Write for a copy today . . . it's yours for the asking.



ACME INDUSTRIAL COMPANY

210 N. Laflin St.

MONroe 4122

Chicago, III.

Makers of Standardized Jig and Fixture Bushings

UP FINAL OPERATIONS ON DIES. GEARS, SCREWS, LONG RODS GOLBORNE Speed Lathes

For economical polishing, lapping or finishing of gears, shafts, dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and

Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.

WRITE FOR DETAILS TODAY

BUILDERS SINCE 1879 157 Division St. Chicago, III.



GOOD

AMERICAN INTERNAL GAUGE



This gauge is designed for accurate checking of internal holes, either machine bored or close ground.

Practical for close and accurate checking of internal splines and gears on both minimum and root diameters.

It is an ideal gauge for any tool room.

Capacity 1/4" to 3".

Price \$54.50

KEENE ELECTRICAL MACHINERY

542 West Washington Blvd.

Chicago 6, Illinois

ELECTRICAL GAGING

One of the secrets of American industrial success is mass production. Mass production requires precision manufacture in all plants so that parts or machines are interchangeable. Precision tools are important but—according to Westinghouse engineers—behind it all stands that super-precise device, the master gauge.

Recently designed devices of this type include the Electrigage by which accuracy of thread gauges, threaded parts, machine-tool lead screws and racks can be checked. The instrument is graduated in fifty-millionths of an inch and readings can be interpolated to about twelve-millionths of an inch. This is equivalent to finding an error of 34" in a mile.

Applied to an internal-external measuring instrument with the same accuracy, the device checks the outside or inside of a ring for taper, bell or out-of-round conditions. Developed jointly by the Sheffield Corporation and Westinghouse, Electrigage uses a mechanical pickup that has a feather touch of but three ounces. Movement of the gauging stylus alters a magnetic circuit to produce a current indication. Amplified as much as 10.000 times and fed to a specially



sensitive milliammeter (with a linear scale and zero center) the pointer shows plus or minus error. Power is obtained from a 115-volt, 60-cycle, single-phase circuit. An automatic stabilizer prevents voltage variation from affecting quality of the results. It is exceptionally fast with good damping characteristics.

MASTER GAUGES

Are Taking the Axis' Measure

THREAD PLUGS THREAD RINGS

PLAIN PLUGS PLAIN RINGS

SNAP-PROFILE

BUILD-UP CONCENTRICITY

JIGS and FIXTURES



2210 Fenkell Avenue

Phone University 3-7676

Detroit 21, Michigan



Attention: Tool Supervisor

Compare Price and Accuracy

PARALLELS

Width 1/4" Accuracy

Hardened and Ground Length 6" Within .0001" in parallelism and straightness on ground sides About .040"

Sold to con-

Depth of Hardness Hardness

Rockwell C 64 + 4

sumers only

COMPLETE SET OF 22 PAIRS from ½" to 1-13/16" in height in steps of 1/16", with case, as illustrated, \$85.—net, F. O. B. New York, N. Y.

Sold in complete sets only and ON MONEY BACK GUARANTEE

THE MOST IDEAL SET OF PARALLELS WHICH SHOULD BE IN EVERY TOOLROOM AND INSPECTION DEPARTMENT

IMMEDIATE DELIVERY ON HIGH PRIORITY.

EASTERN MACHINE AND TOOL COMPANY

170 Broadway

Tel. COrtlandt 7-3579

New York 7, N. Y.

PORTAGE No. 4

HORIZONTAL BORING, DRILLING & MILLING MACHINE



 Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.

MEEHANITE CUTTER BODIES

A new booklet describing Meehanite milling cutter bodies has been issued by Farrel - Birmingham Co., Inc., Ansonia, Conn.



Furnished as unfinished castings, these cutter bodies are available in a number of different shapes and sizes to shope equipped to machine the bodies and braze on their own cutting tips. By carrying a number of castings in stock, the most suitable cutter can be prepared for any given job.

The booklet describes advantages of design, tells why Meehanite is especially suitable for the purpose, and explains procedure for preparing the cutter bodies for use and applying the cutting tips. Also included are tables of sizes, shapes and dimensions for both milling cutter bodies and single point tool shanks.

CENTURY SPLASH-PROOF MOTORS

Century Form J Splash Proof motors in sizes 1½ to 15 hp. are now available with two-way ventilation

with two-way ventilation.

The cooling air is drawn in thru baffled openings in the bottom of the end
brackets by a fan on each end of the
rotor, blown thru and around into all
parts of the motor; and out louvered
openings in the side of the frame below
the center line and at the bottom.

This construction protects the vital parts of the motor during plant wash downs or for outdoor operation.

or for outdoor operation.

This motor is described in bulletin 6-1 page 1, which may be had from the Century Electric Co., St. Louis 3. Mo.

DECIMAL EQUIVALENTS

Dayton Rogers Mfg. Co., 2835-12th Ave., So. Minneapolis (7) Minn. now have for free distribution, two sizes of Decimal Equivalent Chart Calendars, one 7"x15" and the other 18"x27". These engineering Decimal Equivalent Chart Calendars may be had upon request on a company's letterhead.





LIGHTWEIGHT TORQUE WRENCH FOR LIGHT ASSEMBLY! This new lightweight torque tool gives accurate readings of the low torque required in delicate radio, ignition and fuel line assembly ... in work with plastics and light metals where proper tension must be

obtained but where too much pressure may damage the part.

Accurate to inch-ouncest

An addition to the Apco Mossberg line of torque tools, it weighs as little as 6 ounces and fits any standard socket. Aluminum handle and sturdy brass scale with easily read figures. In four sizes: 0-100 inch ounces, 0-30, 0-50 or 0-100 inch pounds.

APCO MOSSBERG COMPANY



Patent

Pending

155 LAMB STREET

ATTLEBORO, MASS., U. S. A.

Other Apco Mossberg Torque Tools in Higher Ranges



THE HOWE-LINDSEY AUTOMATIC SAW SHARPENER

T Syn

· MONEY

CRITICAL MATERIALS

HOWE AND SON, INC.

HINSDALE,

BWAYS TO SAVE TIME

**MONEY with the MEAD

Industrial Burring Machine

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—

done in "free time"—install these machines by every machine tool which leaves burs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.

MEAD Specialties Co.

15 S. MARKET Dept. 24-Y CHICAGO 6, ILL.



For METAL - PLASTIC - WOOD

REDUCES WELDING TIME

Another example of the increased production resulting from changing to larger size electrodes was outlined in a recent letter to The Lincoln Electric Co.. Cleveland, Ohio, from American Welding & Mfg. Co., steel product fabricators of Warren, Ohio.

According to the data given in the letter, this company doubled the previous production rate of tank mufflers by changing from 3/32" electrode to 5/32" size, and decreased the welding time on motor casing frames from three hours per job with the former ¼" electrode, to two hours with a 5/16" rod.

The tank mufflers are of 10-gauge material and were fabricated by fillet welding the parts with one longitudinal butt weld.

The motor casing frames have approximate 12" inside diameter and are 18" in length, made from 1½" mild steel rolled into a cylindrical shape for butt welding with shielded are electrodes.

The Lincoln Company has long advocated use of larger size electrodes to obtain these advantages.

A NEW 1-P3 GUSHER

The Ruthman Machinery Co., 1808 Reading Rd., Cincinnati (2) Ohio, offers a new Belt Driven Gusher Pump known as Model 1-P3. This unit operates in a vertical position and is propelled by a No. A "V" belt using a detached motor or drive shaft.

A one-piece shaft is employed which revolves on two high grade ball bearings mounted

within the tubular section between the plate flange and the "V" pulley.

The Pump stem, flange and impeller housing used in the construction of this model are interchangeable with, and available in two lengths similar to Gusher motor driven Model 1-P3 pump.



Air Regulating Valve

new...inexpensive



These new combination regulators and valves are equipped with a special compound spring, which provides sensitive and instantaneous adjustment for all secondary pressures from 1 to 150 lbs. Send for bulletin No. 83-B—Dayton Rogers Manufacturing Co., 2847 12th Avenue South, Minneapolis 7, Minnesota.

POWER HACK SAW

PORTABLE

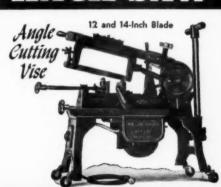
SELF - CONTAINED

STURDY

ECONOMICAL

Write for Bulletin No. 100





The Tools That Make Work a Pleasure



MODEL ABS BACKSTAND IDLER

As an addition to their line of Abrasive Belt Grinders, Porter-Cable Machine Co., 300-12 Exchange St., Syracuse, 8, N. Y., announces their new Model ABS Backstand Idler. It is used to adapt grinding and polishing lathes (jacks) to abstractions of the statement of the statement

rasive belt grinding.

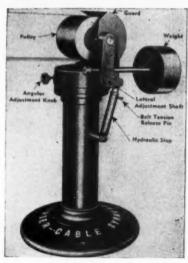
Heretofore, it has been necessary to coat the grinding and polishing wheels with the abrasive or use a solid "stone" wheel. This machine permits use of an endless metal cutting abrasive belt, which is claimed to be faster cutting and to provide the desired finishes more easily, theat is greatly reduced because of the long abrasive belt used. This lower temperature operation is said to decrease such hazards as heat discoloration, warping, fracturing, etc.

ing, fracturing, etc.

It is claimed the same results are obtained by the abrasive belt method as may be had by grinding, rough polishing and finishing on regular wheels, but the rough polishing operation can be elim-

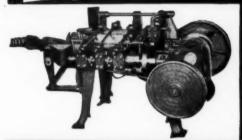
inated.

The Idler is suggested for grinding welds, flash, generating radii, flat and edge work, cleaning up, polishing, etc. Any width belt up to 6" can be used.



TO MEET TODAY'S INDUSTRIAL REQUIREMENTS

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide leed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON Machine Co.



FOR SMALL GAUGE AND FRACTIONAL DRILLS

NE Black Diamond Drill Grinder, in any average Plant, will meet all production demands for accurately ground Small Drills.

On this machine, any apprentice becomes a skilled operator... can produce quantities of sharp drills, ground to perfection... with lips of uniform length... correct angle... proper clearance for accurate drilling.

Black Diamond Grinders cut grinding costs . . . save expensive drills . . reduce breakage . . . release skilled labor for more important work . . . and the Web Thinning attachment efficiently cares for Notched, Colton, or Crank Shaft Points.

If you use small drills, singly or in gangs—you are losing time and money unless you have a Black Diamond on the job.

BLACK DIAMOND SAW & MACHINE WORKS, INC.
45 NORTH AVENUE
NATICK, MASSACHUSETTS

NAVY GUN MOUNT— Resembling a giant cannon, this 25-ton mass of precision-finished steel is the stationary housing for the recoil mechanism of a 16-inch Navy gun. Nearly ready for sea duty on one of Uncle Sam's battleships, the housing gets a final check at the Naval Ordnance Plant operated by the Westinghouse Electric and Manufacturing Company at Louis-ville, Ky.



HYPRO FROG AND SWITCH PLANER

In a giant size broadside, the Cincinnati Planer Co., Cincinnati, 9, O., announces the most recent addition to their line the Cincinnati Hypro Frog and Switch Planer. This is designed for Hypro-duction and is claimed to withstand the heaviest cutting. It is said to excel in rigidity, generous dimensions, evenly distributed weight, balanced power, speed, accuracy, convenience, and safety to the operator. The circular is well illustrated with large, detailed pictures and also carries descriptive matter which will be of interest to those people having a voice in the purchase of such equipment.



Consider the time saved in the tool room and also in production when you use Copper Head Laps instead of making laps in your own shop. But that is not the only saving . . . Copper Head Laps do not wear out. The only wearing part is the replaceable copper sleeve. Adjustment feature permits maintaining correct lapping size till sleeve is warm out and is replaced with a new correctly sized sleeve. Available from stock in standard sizes, $\frac{1}{6}$ " to $\frac{2}{12}$.

BOYAR-SCHULTZ CORP., 2108 Walnut St., Chicago 12, Illinois

For AIRCRAFT and MUNITIONS



1883 GREENERD

The Originators of the Arbor Press

PRECISION WORK IN MANUFACTURING

65 Standard Styles and Sizes. Manually operated presses 1/4 to 35 tons pressure. Motor driven hydraulic presses 11/2 to 30 tons pressure.

Let us send you our catalog No. F.

EENERD ARBOR PR

NASHUA

Est. 1883

NEW HAMPSHIRE

BRADY-PENROD MODEL 7500

Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as standard equipment by many leading machine tool manufac-turers—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kero-sene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.

Incorporated 2500 S. Madison St., Muncie, Indiana, U. S. A. 1945 Santa Fe Ave., Los Angeles, Calif.





ELECTRONIC MILLING MACHINE CONTROL

An interesting new aplication of electronic control is a nnounced by Reed-Prentice Corp., Worcester, Mass., on their new No. 4 Vertical Milling Machine.

The adaptation uses electronic control for the selection of variable feed rates on the power down

feed.

The compact electronic unit is shown mounted on top of the cross slide. Another illustration shows the simplified control station, conveniently located near the spindle head.

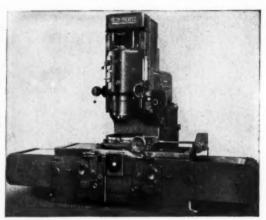
The electronic regulator controls a 1½ hp d-c motor, providing s m o o th, continuous, inflinitely variable feed power to the vertical head. The electronic unit and controller which make up the

circuit, operate on 50 or 60 cycle, single phase current, in the range between 200 and 600 volts. The circuit is said to have an inherent safety factor providing a natural increase or decrease in motor speed to the selected feed rate. It is



claimed that the desired feed automatically holds within a fraction of an rpm. The circuit is self-braking when control lever is set to "Stop" position. Overload protection is supplied for the feed drive in the event of stalling.

All controls are mounted on a single panel. Feed rate is selected by a convenient control, calibrated to provide any

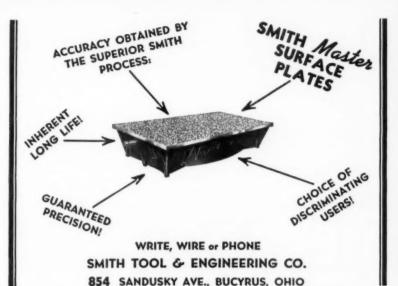


feed desired from ½" to 15" per minute. The number of feed changes within these limits is infinitely variable and a change in feed rate may be effected during operation. A single lever stops head movement and also controls both up and down travel of the head. Safety stops prevent over-travel, while adjustable dogs on the four-position turret stop confine head travel to work limits.

Rapid transverse at maximum feed rate is approximately 40" per minute. Rapid transverse accomplishes speedy approach of the head to the work and also allows quick repositioning.

An attractive new 12 page bulletin gives complete details.







SPEEDMASTER

THE FAST, RUGGED HOIST FOR STEADY WARTIME SERVICE

Here's why—Few moving parts plus simple design keep Speedmaster maintenance down. With sturdy construction, Master gear head motor, worm gear bathed in oil, antifriction bearings throughout, the Speedmaster is built to take tough wartime service. Speedmaster runs fast, stops quick and holds tight. Fourteen models and speeds to 60 feet per minute to meet a wide range of application.

Write or wire—To get the latest Speedmaster literature and the name of your nearby Master Representative, write or wire us today.



MASTER ELECTRIC CO.



SPECIAL OR STANDARD GAGES OF ALL TYPES

These special segment thread gages are examples of the wide variety of thread, plug, and ring gages being regularly produced in our plant. Designed by our staff of engineers and manufactured to specified tolerances, they represent the highest skill and craftsmanship. The same high standards apply to special tools, fixtures, machines and parts, produced singly or in volume on contract. Our facilities and equipment are equal to the finest in the country. Write for literature describing these special engineering and manufacturing services, and our line of standard gages, carried in stock for prompt shipment.

MERZ Engineering Company



on work, gripping it securely. Head may be bored different diameters and depths for different jobs, as shown at right, giving multiple service from each chuck. Indicating unnecessary in production since

Greatly speeds produc-

pieces run on Greatly speeds producsame set-up as tion. Sizes for any lathe. head boring. Send for Folder MB. Established 1917

The GILBERT-BAKER-MIDLAM Co.





FOR USE IN AIRCRAFT AND WAR INDUSTRIES



Every War plant needs SOUTHWEST Plastic-Tipped Mallets. They can be used for sheet metal work, radio, electrical work, caulking, lamination, upholstery, and assembly work of all kinds. They can also

be used on metal and plated surfaces without any damage to the material. Extra tips are immediately replaceable by hand because they are threaded.

Write for Information

P. O. BOX 776

SANTA ANA, CALIF.

Have Your Plates Re-scraped

by a Nationally Known Surface Plate Manufacturer!



Equipped for precision finishing by a staff of Skilled **Specialists**

All Makes ... Moderate Prices ... Prompt Service ...

> Write for Quotation and Literature

Lapping Plates Made to Order! Prompt Service!

SQUARE SURFACE PLATE & TOOL COMPANY 221 N. MAIN ST.

ROYAL OAK, MICH.

MAKING PROTOTYPE DIES QUICKLY



A new production system for making drop hammer dies for prototype and sample parts has been installed in the plants of Castaloy Corp., Detroit and Los Angeles.

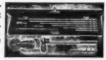
The uniform procedure embraces these steps: — construction of a master model or template; production of plaster pattern of this master model by casting; the casting of dies, embodying identical contours of master model, from plaster pattern.

PRECISION TAPPER
Taps guided by precision leads, Class 3 & 4 specifications easily met. 4 speeds. Ball hearings, throughout

4 specifications easily met. 4 speeds. Ball bearings throughout. Available as floor model (with coolant system) or table model; also automatic air stop for bottom tapping.



Highest accuracy and finest workmanship. Available 11/28 — 128 sets.



Brand Telescope Gages 5/16"-2½"
Handy Knurler, useable drill press or lathe.
BRAND TOOL & SUPPLY CO.
500 W. Washington Blvd., Los Angeles 15, Calif.

This process not only produces a die for the stamping of the parts, but also provides a means of casting checking fixtures for other subsequent operations on the part. Dies are cast directly from standard size plaster patterns of part, in a large tank containing circulating, cooling liquid. Cooling of a die is accomplished in approximately 45 minutes. The metal used, a standard, low melting point alloy known as Cerrobend, can be pumped thru a long, rubber hose to any job that is ready for pouring, As Cerrobend cools, it doesn't shrink, eliminating problems of machining. An-chor lugs and cores for holding die in drop hammer are mounted and cast in place during pouring. Fitting of tem-plates and all grinding, filing, chipping and polishing operations are unnecessary. Desired thickness of the metal is added to the die by means of a special spraying technique. Aluminum, steel, plastic parts can be made in quantities of from one to 50 or more, depending on the type of material, thickness and accuracy required. Both time saving and accuracy recommend this procedure.

Illustration shows on the left, solid Cerrobend male punch; center, foreground is original plaster model; center background is the die set—(punch & die) showing location for drop hammer mounting. Right, solid female die.

FLEXIBLE TUBING MANUAL

A new 36 page illustrated engineering manual (SS-44) on Rex-Flex Stainless Steel Flexible Tubing and Bellows has been issued by Chicago Metal Hose Corp., Maywood, Ill. This manual contains much engineering data and specifications not heretofore published. Characteristics of the product are shown in detail, with tables of sizes, weights, wall thicknesses of the various wall forms, together with





ECONOMY

MACHINE PRODUCTS

COMPANY



DYKEM STEEL BLUE STOPS LOSSES making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

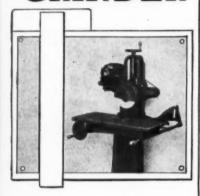
THE DYKEM COMPANY 2301G N. 11th St., St. Louis, Mo.

(In Canada: 444 Pacific Ave., Toronto, Ont.)

5207 Lawrence Ave.,

Chicago, Ill.

T-SQUARE ACTION* SURFACE GRINDER



Don't tie up your expensive cutomatic grinder on small jobs! Builders "T" Grinder will do fussy work which cannot be efficiently handled on a large machine. Lower in first cost, it saves money by shorter set up time and faster production on small work, without sacrifice of accuracy or finish. Prompt delivery.

Write for Bulletin 644

Suits your grinding requirements to a T

*Patented T-square action eliminates usual intermediate table.

BUILDERS IRON FOUNDRY



21 Codding Street Providence 1, Rhode Island pressure data, minimum bending radii and a wealth of other detail useful to the engineer. Complete data is also given, with diagrams and instructions for attaching fittings, and recommended design procedure for various types of applications. A feature of special interest is the double page spread giving, in chart form, line-loss data on Rex-Flex Tubing and Elbows.

BLANK & BUXTON DEVELOPMENTS



A high grade 12" tool room rotary table has been developed by Index Machine & Tool Co. It features ball type main bearing, quick acting worm throw out, single motion positive table lock which does not cramp table out of alignment, coolant trough cast in base, hardened and ground worm, etc.



Also in answer to many requests by users, they have designed the proper attachments and are equipped to furnish measuring rods, indicators and micrometer heads to be installed on the latest model Index Mills. With this equipment the user will be able to locate and bore holes in an area 8"x16". The indicators

are graduated in .0001" and graduations are so liberally spaced that inexperienced operators should have no difficulty in locating holes exactly where wanted. This new feature, along with power feed to the spindle already incorporated in Index Mills, will make it possible for the ordinary shop to purchase a machine capable of doing close locating and boring

Description, prices and literature may be obtained thru the national distributors, Blank & Buxton Machinery Co., 3100 E. Michigan Ave., Jackson, Mich.

LEVER TYPE SPEEDICHUCK



General Die-Stamping-Tool Co., 265 Canal St., New York (13) N. Y., has developed a new Lever-Type Speedichuck. This not only increases the collet capacity of ½" lathes to ¾", but allows work to be chucked, fed, machined, and released without stopping lathe. It is claimed to respond to the slightest pressure, and because it may be locked or unlocked so easily, is ideal for women operators.

The attachment fits such lathes as the 10" Atlas, Logan, 9" South Bend, 12" Clausing and Craftsman, as well as any other 1½"x8 thread spindle lathe which has a No. 3 Morse Taper on the inside, without drilling or tapping. It is ready for instant use and interchangeable on any lathe of conforming spindle, without impairing its accuracy—a distinct innovation in this type of equipment. The floating closing sleeve is said to compensate for any misalignment of the lathe spindle, and hardened rollers reduce friction to a minimum. All parts are hardened and ground.

ANOTHER BAKER-BUILT MACHINE



MODEL No. 314-A (Universal Quick Change Type)

Ample capacity to drive 3-inch diameter high speed twist drills to limit of their efficiency in steel. Also adapted to boring, counterboring, facing, forming and tapping operations.

BAKER BROTHERS, INC.



POLISHERS! 44 to 30 H.P. Capacity

A size and type for every need—one motor and two motor types—single spindle and double spindle—single speed and multi speed—direct drive and V belt drive—wide spread and narrow—bench mounting and floor mounting and a host of others. All, however, have such inherent Hisey features as hall bearing spindles, safe motor control, oversize spindles, etc.

Tex-drive Buffers with V belt drive, afford any selected speed which together with size of motor can be altered at will to meet changing requirements.

I. V. S.

(Infinitely Variable Speed)

Hisey I. V. S. Buffers afford any spindle speed from 1000 to 3500 R.P.M. by merely turning a hand wheel—this is practically a necessity when the same machine is used for cutting down, buffing and coloring. It also provides the correct speed for any size new or worn down wheel.

New Catalog is new on the press which lists many new and redesigned machines since last issue. In it you will find one of the most complete lines of Grinding and Buffing equipment.

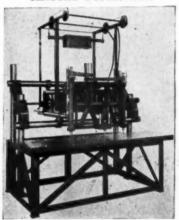
While many Hisey machines are still going to war we are in position to make better deliveries than for some time and will also consider building some special or semi-special equipment.

-WRITE FOR CATALOG 70 BH-

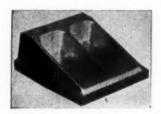
Hisey THE HISEY-WOLF MACHINE CO

The makers emphasize that the design is possible because it is built for use with the Bren collet, whose body ends in a No. 3 Morse Taper, which is held firmly in the lathe spindle. This eliminates in accuracy of conventional type collets which require separate adapter closing sleeves. Closed by squeeze action, the Bren collet avoids longitudinal movement, assuring accuracy on cut-off and forming operations, etc.

CENTURY DUPLICATOR



Century Engineering Co., Los Angeles manufacturer of special machine tools, has developed a high speed duplicating machine for quick and accurate production of parts from forged stock. Two spindles, with a speed of 10,000 rpm are driven by a 10 hp motor. Operation is manual in the vertical and fore and aft planes, with longitudinal movement controlled by switch buttons located at top of each handle. This control moves carriage right or left to determine amount of cut.



The machine does not require skilled labor and set-ups are made quickly and easily. With this machine, expensive dies and forgings are unnecessary for limited production runs. Immediate delivery is available.

The part shown in the accompanying illustration was hogged out of a solid piece of 24 st. forged bar stock by tracing the stylus over a Zamak pattern. This part is approximately 5x5x2" deep and required 20 minutes to rough and 15 minutes to finish, compared to about two hours by conventional methods.

MIDGET AIR CONTROL VALVE

An unusually compact solenoid air control valve which can be operated at sustained speeds up to as high as 400 reversals per minute is a recent development of the Ross Operating Valve Co., 6480 Epworth Blvd., Detroit 10, Mich.

This newly designed valve, known as Ross model No. 835, is a ¼" heavy duty, solenoid operated, 4-way valve for the control of double acting cylinders; it may also be used as a 3-way valve by plugging one outlet. This valve utilizes the same poppet type principle that the company has been building for the past 20 years.



Overall dimensions of this model No. 835 are length 7'', width $3\frac{1}{2}''$, height $5\frac{1}{4}''$. Other noteworthy features are its low current consumption, noiseless operation and long life.

Presenting A SUPER DIAMOND WHEEL

CUTS MUCH FASTER — LASTS MUCH LONGER

Diamond Tools & Wheels
To Your Specifications
SEND US YOUR PROBLEMS



Free Engineering Service

DIAMOND WHEEL INDUSTRIES, INC. 57 E. JACKSON BLVD. CHICAGO 4, ILL.

FOR IMPORTANT

Can't wait you should investigate the machine that is cutting time and costs in today's busy toolrooms. Note the following valuable features of the



HIGH-SPEED MILLING and JIG BORING MACHINE

Compact, rigid construction . . . designed and built as a precision machine with generous table size for such a small floor space (18½" x 20"). Choice of 8 speeds, 275 to 4250r.p.m. Direct micrometer reading and setting

to eliminate pencil errors. No backlash, Quick set-ups . . . easy changeover . . . frees larger machines for heavier work. Saves time and power on all small toolroom jobs.

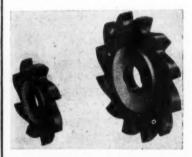
Bulletin on request.

LINLEY BROS.

663 STATE ST. EXTENSION BRIDGEPORT 1, CONN.

BOOSTING AIRCRAFT PART PRODUCTION

A production increase of 300% in milling aircraft landing gear parts is reported as a typical example of the performance of a new type carbide tipped milling cutter with cast alloy body developed by Super Tool Co., 21650 Hoover Road, Detroit (13) Mich. On this job, a 6" diameter cutter ¾" wide is used to cut a slot ¾" wide and 2½" deep from the solid in 3140 steel. Rate of feed is more than 600% heavier than with regular high speed steel cutters, resulting in tripled production.



Made with a minimum number of flutes necessary for various classes of work as determined by exhaustive tests on actual production work as well as in the laboratory, these new type cutters are made with such simplicity of construction that their price is reduced to a point where they can be used generally on short runs and for general shop tooling, according to advice from the factory.

advice from the factory.

The greater speeds at which these carbide tipped cutting tools can operate leads to increased table feeds and at these higher speeds, it is said, the finishes obtained are comparable to ground surfaces.

Greater accuracy also is claimed at these higher operating speeds. The feed per tooth being lower, the cutting pressure is lessened and there is consequently less distortion of the work. Another advantage claimed is the throwing off of a major portion of the heat in the chip, leaving less to be absorbed by the work and the cutter.

On actual production jobs, it is asserted that many of these new cutters are being used successfully in steel at surface speeds of 400 to 600 feet per minute with tooth load varying with the hardness of the steel from .0005" to .0025".

LEACH External Grinder

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A real helping hand! Heimann Transfer Screws are quick, accurate mark-

ers in setting dies. No wrench needed. Six hardened screws nested in holder (see below). Uniform height hex base to point, insuring clear uniform indentations. Send for circular.

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HEIMANN MFG. CO., URBANA, OHIO

All

These tools are working efficiently on extremely hard materials that ordinarily cannot be machined with high speed steel cutters, it is said.

Standard cutters for cutting cast iron, brass, bronze, copper, aluminum, magnesium, and plastics are supplied in diameters from 3" to 8" in a variety of widths. These tools are 4 or 6 flutes. For cutting steel, sizes are made with 6 to 16 flutes according to the diameter.

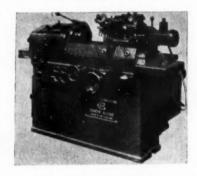
A folder showing specifications, prices and complete details is available.

SWISS THREAD GRINDER

The Cosa Corp., Chrysler Bldg., New York is exclusive representative in U. S. and Canada for High Precision machine tools and measuring instruments as manufactured by Societe Genevoise, Geneva, Switzerland, of which the RU-2 High Precision Thread Grinder is an example.

Since 1917, Societe Genevoise has built High Precision Thread Grinders and the RU-2 grinds internal and external threads and is equipped with a micrometer stop which permits settings to 0.00005".

This High Precision Thread Grinder is equipped with a microscope which allows inspection of both wheel and work profiles as to angle and radius. This microscope is easily tilted out of the way during grinding operations and use of this microscope facilitates superimposition of the reticle profiles on the work contour.



The RU-2 has a temperature compensator which permits at will, increasing and decreasing the pitch of the threads ground, either to allow for cooling effect of the water supply or to obtain a pitch

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But there are many more benefits offered by HERMAN Precision Granite SURFACE PLATES. It's worth your while, we believe, to get ALL the facts. Write or wire!

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12"x18" — 75 lbs. 18"x24" — 160 lbs.

20"x30" — 275 lbs.

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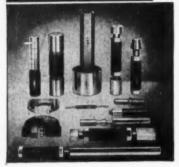
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Guaranteed accuracy—maximum error in 0.00008"; pitch within 0.00016"

The results obtained with this High Precision Thread Grinder are said to have been outstanding, especially in its application for the grinding of both male and female thread gages, precision taps, mi-crometer screws and buttress threads.

LUBRICOOLANT

The makers say Lubricoolant is a new type of material, designed as a superior replacement for the conventional cutting oils and coolants. It is manufactured by The DuBois Co., 1120 W. Front St., Cincinnati. Literature published by that Company states that Lubricoolant has shown tool life prolongations ranging from 12 to more than 60% on metals, all the way from chrome-molybdenum steel to aluminum alloys.

The work is held at levels not measurably above room temperature. Elimination of "dry welding" of chips to the cutting edges of the tools is said to be achieved. Lubricoolant is transparent and thus facilitates a high degree of working ac-curacy. High working speeds are possible, and mirror finish work can be obtained. Lubricoolant is also said to be completely free from objectionable odors and to aid in the elimination of dermatitis.

Literature and other data on this product, "manufactured in the heart of the machine tool industry", are available.

HANDY CARBIDE GUIDE

A vest-pocket "handy guide" to top performance in steel cutting with carbides (Manual GT-166) has been issued by Carboloy Co., Inc., 11139 E. 8-Mile Road., Detroit 32, Mich. The booklet covers the characteristics of different grades of carbides designed for steel cutting, selection of proper rake and relief angles, size of radius, etc.

Major considerations as to machine requirements, speeds and feeds are given together with grades recommended for different classes of steels. Design and grinding of chip breakers is dealt with in detail, as is the problem of supplying coolant in proper amounts and properly directed.

The 16-page pocket guide concludes with operating hints and "Do's and Dont's" on carbide tools. Of particular interest are the trouble-shooting suggestions to be followed in case of tool chatter.

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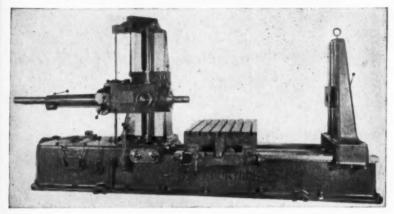


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MINNEAPOLIS 13, MINN.

PRODUCTION LATHE

PORTAGE NO. 4 BORING-DRILLING-MILLING MACHINE



An attractive, new 8-page bulletin presents the Portage No. 4 Horizontal Boring, Drilling and Miling machine. It is made by The Portage Machine Co., Akron, 11, O., and is a rugged unit designed to provide the speed and accuracy demanded of modern machine tools.

The entire bed is a sturdy, reinforced, one-piece casting. This makes for rigidity which is essential in high speed, accurate work.

Control levers are located on the front, at convenient height, and within easy reach of the operator at his normal working position.

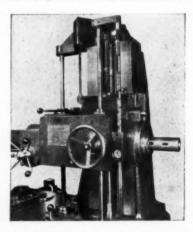
Power rapid traverse is available for any unit having feeds and is obtained by moving the engaging lever in the reverse direction. Traverse rate is constant and always in a direction opposite to power feed. It is impossible to engage power feed and power movement simultaneously.

Precise repositioning of bar support bearing is accomplished without difficulty when replacing tailstock.

Hand adjustments in addition to automatic feeds are provided for the spindle saddle, spindle travel or movement, table saddle and table. All screws are fitted with large dials graduated in thousandths.

Filtered oil is automatically and positively circulated by a chain driven Brown & Sharpe geared pump thru the lubricating system for the shaft bearings and gears for speed changes, feed changes and feed distribution. A piston-type Bijur pump, operated by a cam on the spindle sleeve supplies filtered lu-brication for the various bearings for spindle, drive and feed shafts in main part of the head. A second Bijur unit operated by a cam on the cross feed shaft automatically lubricates the table ways, nut and screw, gears and shaft bearings for the table cross feed.

Spindle diameter is 4" (Morse Taper No. 6); spindle traverse, continuous, 30".



DIFFERENT JOBS REQUIRE DIFFERENT VISES



For clamping parts of varying thickness.

Each Model in Three Sizes



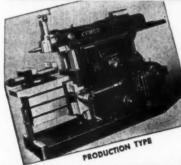
For clamping parts of uniform thickness.

By choosing a vise according to the character of the parts to be clamped, you can step up your production rate tremendously and also greatly reduce spoilage losses. This is why many manufacturers engaged in war production are changing over to the two types of Presto-Vises above illustrated. Send for literature and see how these two vises will enable you to cut down production costs in peacetime as well as in wartime.

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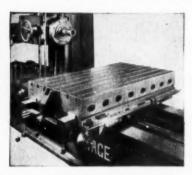
4½," firebrick, backed up with 3½," insulation. Lid-lifting mechanism raises cover eatity and locks it in UP position. Burners located near top of combustion chamber to insure longer pot life. Economical to operate, as large blower assures maximum performance, Steel pot 14" wide, 20" deep 3375 F.O.B. Factery. Also available in pet sizes 14x16 and 14x18.

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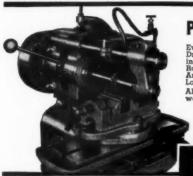


There are 18 spindle speeds, ranging from 16 to 610 rpm; also 18 feeds to main spindle, ranging from .0015 to .231" per revolution. Likewise, there are 18 milling feeds to table, saddle and head, ranging from .005 to .659" per revolution. Rapid traverse is approximately 100" per minute. Maximum distance from face plate to outer cupport is 7'6". Maximum distance, top of table to centerline of spindle is 36". Working surface of table is 36x60", cross travel of table is 48", width of bed over ways is 36" wide and 7" width of ways on bed. A 10 or 15 hp 1750 rpm motor is required. Approximate net weight of the standard model is 28,000 lbs.

CAST TOOL OUTPUT INCREASES

The vastly increased production of cast Meehanite tool shanks, forming tools, and milling cutter bodies at The Cooper-Bessemer Corp., Mount Vernon, O., has reached a volume sufficient to release at least 1,700,000 lbs or 850 tons of critical high tensile steel for producing other vital war material, according to foundry technicians of this pioneer engine builder. Orders received so far this year already show a total volume more than double that of 1942.

Inability to obtain forged tools for some of their machining operations, due to the nation-wide shortage of these accessories, influenced the company to utilize their broad facilities and skilled foundry techniques in developing and producing cast tools of Meehanite, a non-critical metal which has many desirable physical characteristics. Exhaustive tests are said to have proved that Meehanite cast tools are superior in many ways to the previously used tools made of critical steel. It is especially helpful in damping vibration.



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Everything in Machine Vises—from small 3" Drill Press Vise to 9" Heavy Milling Machine Vise including hardened and ground Precision Tool Room and Jig Borer Vises, Plain, Swivel and Angle Vises in various sizes—Quick-Acting Cam Lock Vises for production purposes.

All are of modern design and made for rugged wear and accuracy.

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THE NEW MARSCHKE "IN-BETWEEN", DIRECT DRIVE SWING FRAME GRINDER —

It's What Its Name Implies . . . for service requiring a machine with capacity "between" heavier, larger Swing Frame Grinders and lighter, lower-powered portable Hand Tools and Flexible Shatt Machines!

The Marschke "In-Between" has the maneuverability of portable hand grinders, but it has a larger wheel with considerably more power and the added advantage of greater dependability and longer life. However, it's a LITTLE Grinder by comparison with an average Swing Frame Grinder.

For cast iron snagging it is recommended with 3 HP., 1800 r.p.m. motor driving a 12" x 2" wheel and for alloy steels a 3600 r.p.m. motor and 10" x 2" wheel.

Its combination of balance, swivel collar suspension and light weight enables operator to angle machine to any position and apply wheel to every exposed surface on all sizes and shapes of castings. It is equally efficient for reducing seam welds of plate, tank and other structural work. You will like this machine. For additional details WRITE TO—

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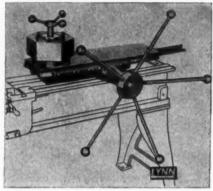
CONVERSION BED TURRET

A new, heavy duty, surface in-dexing bed turret and cut off cross slide Model BT-3 has been developed by Lynn Mfg. Co., 218 Elroy St., Minneapolis, 8, Minn. The attachment is designed for large standard engine and other lathes up to 24" swing. It converts such lathes for screw machine and turret work, meeting the current demand for quick and economical tooling-up of present equipment for precision work and fast production on a large range of items.

The makers point out that the BT-3 can also be mounted on standard turret lathes where replacement of the turret is necessary or desirable. The units are equipped with adjustable vases for attaining alignment and to com-

pensate for wear.

Features emphasized by the makers include:-91/2" hexagon head; 6 positions: 10" travel; automatic index of stops to each position; easy action; large pilot wheel; head designed to bore out tool holes to 1½" or less when mounted on operator's lathe; sturdy, heavy-duty con-



struction throughout; with all hand scraped bearing surfaces and specially hardened indexing parts. Can be operated by unskilled help. Cut-Off cross slide with back and front adjustable tool posts are available to complete the unit.



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is a Double-End Hydraulic Machine equipped with Trunnion type index fixture for DRILLING . . . ROUGH BORING . . . FINISH REAMING . . . UNDER-CUTTING . . . Piston-Pin Hole in piston . . . Two complete pistons in one pass.

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AMES Precision BENCH LATHE Known for 40 years as a precision lathe of the highest quality. Bed 36" long. Ball bearing headstock uses 1" capacity collets. Swing 83 8" over bed. Available with motor drive. Send For Catalog B. C. AMES CO., WALTHAM, MASS., U.S.A.



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12253 Coyle Ave., Detroit 27, Mich.

in use of carbide tipped lathe, shaper and planer tools is that some manufacturers of such tools have been able to put them on a mass produc-tion basis. This, in turn, allows the cost of using such equipment to be appreciably lowered. Tools as sup-plied by one maker, are all ground ready for use, with the ground-in chipbreakers for steel cutting tools included.

There are some materials that are practically unmachinable with ordinary cutters. In one case where there were large quantities of laminated Micarta strips to be profile-milled, there were frequent tool failures until a set of interlocking milling cutters having their cutting edges tip-ped with a certain type of sintered carbide were put to work. It was found that more than 100,000 pieces were produced between cutter grindings.

Grinding of carbide tipped tools in the small plant.

the small plant, where there is not stifficient grinding on this class of work to justify installation of a regular carbide tool grinder, is quite often done on the regular shop tool grinder, provided it be a good rigid machine.

A silicon carbide wheel of about 80-grit is used in cases where it is not convenient to carry two different wheels for the purpose on the grinder. Where two wheels can be carried without trouble, it is better to use a 60-grit wheel for roughing, and 100-grit for finish grinding the tools.

CARBIDE TIPPED TOOLS

The use of tools tipped with carbide continues to increase, and is extending into more fields. Manufacturers that ordinarily make certain kinds of tools from some specific type of highspeed steel, often extend their borders by providing the same tools, when desired, with carbide tips. This is true of a line of boring tools, which, tho ordinarily furnished in highspeed steel, are also made available with either tungsten or tantalum carbide tips.

One of the results of the large increase



This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x361/4" band. The ideal portable unit. OTHER STYLES AND SIZES IN NEW

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Jaws are hardened and ground. Special outstanding features are the size and opening of jaws—4" Jaws open full 4"; the 6" Jaws open full 6" etc., with corresponding depth of Jaws. Vise can be used as ordinary vise when lowered to horizontal position. Swivel bases furnished if desired. Sizes 4", 6" and 8" Jaws and openings. Prompt deliveries.

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PRECISION WORK AT ANY ANGLE

DIE SETS

Separation of die sets has been a problem in many shops. It is difficult to part them if they have ever been abused during a prior separation. For this reason any new men coming into the shop, and working with them, should be carefully observed as to how they handle the dies. Prying and hammering not only should be discouraged, but forbidden.

Really, the proper way to handle this problem is to use regular die set pullers that have been designed for the purpose. They permit safe and sure separation, and are fast and accurate. These pullers

are a real help in grinding, mounting and fitting of punches to the dies. They enable the operator to raise the punch from the die, readily and quickly, positively holding the set at any required height during the process.

Another precaution has much to do with the proper operation and ready separation of die sets. This is proper lubrication of leader pins. Also, if these pins can be kept lubricated while in operation, un due wear on bushings will be eliminated, and accuracy will be maintained in punch and die registration.

With this lubricating problem under consideration, one manufacturer of quality die sets has developed a universal oiler for leader pins. The oiler consists of an oil - retaining ring made of steel, embodying an absorbent wick.

The ring is normally held in a position near top of die set leader

pin by means of a compression spring, encircling the pin beneath the ring. The downward action of punch press, when die set is forced shut, drives the lubricaing rings downward on the pins against the resistance of the compression spring. As die set opens with return motion of the press, the compression spring causes lubricating rings to follow again to the upward position.

In this way, lubricant is continually applied to almost the entire length of the pin directly, and easily reaches balance of it thru the wiping action of the bushing.

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Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

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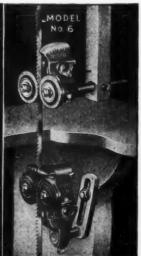
manufacturers using Paddock Guides.

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Special application of Federal Dial Food Press with 20 stations, operating at 60 to 50 strokes per minute.

Every day, Federal Dial Feed Presses are solving more production problems—performing a wider variety of jobs which, until recently, were not thought of as press operations. As a result, the need for highly specialized machinery of limited utility is often eliminated. And production speed is often increased 3 to 6 times!

Federal Presses will be equally effective tomorrow, for hundreds of uses in low-cost peace-time production—with practically no



reconversion costs. Orders are now being accepted for prompt post-war delivery.

THE FEDERAL PRESS CO. 602 Division Street, Elkhart, Indiana



WRITE FOR NEW CATALOG

V BLOCKS

Many shops have tried to get along with inadequate supplies of V blocks, and have thereby lost sufficient time on occasion to more than pay for the additional ones that would have been required to work to the best advantage. There are times when it just happens that V blocks are needed at the shaper, milling machine, drill and grinder all at the same time. It is possible to organize the work so that one or more machines can wait on V blocks until the others have finished with them, but efficiency is lost in so doing.

Again, many times it would be much better if a greater number of V block sizes were on hand. Time is lost in machining work in V blocks that are really too large or too small.

One firm which produces semi-steel V blocks for use on all sizes of round work has them in five different sizes. They have ribbed sides, and are precision ground.

V blocks are produced uced by some makers in two diferent types, one of which is especially valuable for accurately laying out round work in connection with a surface plate or knee, as well as for general machinists' work, drilling, grinding, milling, etc.

Clamps are furnished with these V-blocks, having a knurled handscrew which can be readily turned down to hold the work in the blocks. Some of the se have the knurled portion of the screw drilled so that a rod can be inserted, to aid in tightening the

screw. Some have ribbed clamps for extra strength, while others have plain clamps. Such are sold in pairs and cannot be obtained singly. Some are of cast iron. Others are of tool steel.

The other type is a single V block that is fitted with a clamp, and designed for use as a general handy tool for holding small circular or flat pieces for milling, drilling or grinding. This particular V block has holes drilled thru it, extending from the working vee downward. This is done to allow round work to be nested in the vee while drifts are used or while taper pins are driven out.





The FORM-MASTER ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in horizontal position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two Brazilian 1/3 ct. diamonds and instrument case included.

It readily produces: Any desired angle; Convex radii to 4"; Concave Radii to 7". On 7" wheel,

Specifications: Base 3"x3", height 8½": Wheel capacity 8"; Angular travel 3".

For information or a demonstration CALL YOUR SUPPLIER.

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J & S. TOOL CO. 477 Main St., East Orange, N. J.
PRECISION DRESSING TOOLS

THOR BLIND RIVET DRIVER

A new device that will drive four "blind" rivets a minute in aircraft production, saving time equivalent to that required for building of 20 more bombers a week, has been introduced to the Army, Navy, and West Coast aircraft industry by manufacturers of Thor portable tools.

The new rivet driver, pneumatically operated, will drive and buck in one speedy operation, the "blind" rivets on finished plane sections to which are connected de-icers, instrument panels and other light assemblies.

The tool operates in a fast 4-step cycle and features a light at top of handle which flashes "OK" to indicate when rivet has been accurately upset on "blind side. First step in the cycle screws a mandrel into rivet; second step pulls back mandrel, upsetting rivet and flashing on the "OK" light; third step unscrews mandrel; fourth shuts off tool, completing cycle and making it ready for next operation.

Weighing only 4¼ pounds, the machine measures 9½" in length, has a spindle



offset of 7/6" and a speed of 1,000 rpm forward and 2,000 rpm reverse.

Known as the Thor "Riv-Driver" the new instrument makes practical for production use a wider application of "blind" rivets, not only on aircraft but also on scores of other assembly operations. Details are available in Bulletin No. 247 which may be obtained from Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago (7) Ill.



Blades, tested for proper hardness stand up under hard usage. One Anderson blade is equal to an ordinary hand scraper reforged about 5 times. When worn out a new blade makes a new scraper. Making scrapers from old files is too costly; hand made and forged scrapers cost three to five times more. No need to grind an Anderson Blade... stoning is all that is required. Blade cuts faster, lasts longer and saves grinding time. Blades purchased by the dozen cost only about one-tenth the cost of making one by hand.

Write for complete information.

ANDERSON BROS. MFG. CO.,

1917 Kishwaukee St., Rockford, III.



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The tool steel jaws of the Parker Vise hold delicate work firmly, yet carefully. For the extra-hard, even surface of these jaws eliminates marring that comes from chipped, uneven jaw faces. For added protection, the entire top of the Parker Vise is covered with tool steel. Jaws are



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Resharpen **Dull Taps**

Easily! Quickly! Accurately!



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Can be used on almost any type of tool and cuter grinder, surface grinder — even bench lathes. Tap is held in chuck — may be sharpened after center is destroyed. Ne collets. Complete. No extras. Write!

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protractor. Simple shifter for 2-3-4 flute taps. relief Variable thru adjustment screw. chamfer diagram on index plate.

· Capacity to 34" hand tap. ORDER NOW!

Also manufacturers of READING BROACH KEYSEATER

The Reading Bench Machine does not require bushings or quides. No other machine like it. Very fast capacity from 1/8 to 3/8 cutter. Low first cost - prompt delivery.



READING MACHINE

READING (CINCINNATI) OHIO

A PRECISION POINT LOCATER

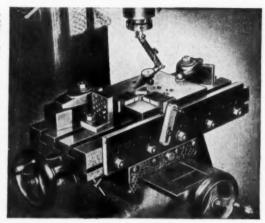
A Precision Point Locater for use in Jig Boring has been developed by Brill Industrial Laboratory, 27245 West 13-Mile Road, Route 1, Birming-ham, Mich.

In use, Locater is posi-tioned at the location where it is desired to bore a hole. The edge plates are held against edges of work piece by thumb screws. In between are inserted gage blocks of proper size. A wooden Holder keeps Locater in position while first one gage block combination and then a second gage block combination are slid edgewise, thereby providing wringing adherence between Locater, gage blocks and edge plates. Locater is

then brought true with spindle by means

of an indicator.

In explanation, the makers say these precision points are actually narow ledg-



es of just the right width, over which indicator points operate with supreme ac-curacy. "Tenth". indicator needles re-peating, exactly. In fact, indicators work

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AIR PRESS

The new Mead Air Press delivers 400 lbs. pressure on 100 lbs., line pressure. Handles many staking, crimping, assembly, and similar operations. Stroke of ram adjustable from 0" to 2". Maximum clearance 4". With foot control this press will speed up countless bench jobs, save muscular effort. Write for new AIR POWER Catalog - just off the press.

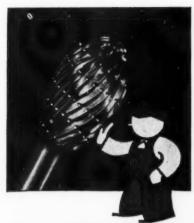


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Patent Applied For

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A Shearing Cut with "CHATTERLESS FLOWING ACTION"

Increased production and longer cutting life with curved tooth cutters.

Plain Milling, Staggered Tooth Side Milling, RH or LH Half Side Milling, Overlapping Side Milling, Right and Left Hand Shear Side Milling and Woodruff Keyway Cutters.

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ABER ENGINEERING WORKS INC.

at their very best over these newly developed precision points. Note also that the actual alignment error is only half the total error shown by the indicator.

Holes are located from same work piece edges from which final inspection will be made. The entire locating system functions at the same temperature as the work piece, thereby avoiding errors due to thermal variations in size.

The wringing surfaces have been developed to such a shape as to provide optimum wringing under various conditions—even when set-ups are not quite square. Usual working squareness is adequate.

Indicator face is set horizontal and is always in view from one position during indicating operation.

The device rapidly provides complete location in two directions at one setting.

It is not necessary to locate work paral-lel to table travel. Can also be set up against parallels and angle plates for other than square work. Gage blocks can be inserted between Edge Plates and work piece to bring Locater as near edge of work as desired. Can also be used on general types of vertical mills, and on jig grinders



Locater size is 1.200", with maximum accumulated error plus or minus .000050". Hardened and ground, all working faces are square and lapped for wringing. Bevels on bottom corners of Locater prevent dirt from entering wringing combination. Grooves on faces of edge plates serve same purpose.

The device is claimed to do away with dependence on lead screws, verniers, telescopic devices, end measuring rods, long range indicators, etc.

Set consists of Precision Point Locater. Long Edge Plate, Short Edge Plate, and wood hand tool for properly directing pressure on Locater during wringing operation.

DEPEND ON DUBLIFE GAGES

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REVERSIBLE PLUG GAGES



Originators and exclusive manufacturers of Dublifo Gages & UPPCO Finish.

The DUBLIFE reason: You have a brand new gage in your hand even after long use.

Both "Go" and "No Go" Plugs in same handle, are reversible. When either plug shows even the shadow of wear, turn plug end for end and you have a new gage. Beautiful products of most modern metalcraft. Exclusive UPPCO-Lapped finish.

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In 85% of counting applications a standard unit will meet requirements. Write Bulletin No. 100—a concise, ready Stroke Counter for recommendations on your counting reference catalog of 100 standard models — sent at your request.



Model 5-H-1-1-R

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PRODUCTIMETERS THE SPEEDOMETERS OF INDUSTRY 180 EDDY STREET PROVIDENCE 3, R. I.

BOOTHCOTE BREAKS BOTTLENECK



Robert Holder, of the Harris Soap Co., Buffalo, N. Y., demonstrates a new use for their Boothcote, spray booth coating widely used in war plants. Over-spray from spray-painting operations which ordinarily would have to be laboriously scraped off is here effortlessly removed by stripping it off in sheets. The Boothcote is sprayed or brushed on the conveyer parts before painting begins. The photo was taken in one of the modern aeroplane plants of Curtiss-Wright Corporation.

LOW TEMPERATURE WELDING

Eutectic Welding Alloys Co., 40 Worth St., New York, 13, N. Y. have issued a 36 page welding data book. It contains timely facts on low temperature welding for fabrication, salvaging and general maintenance in all types of war industries and postwar applications. There are numerous helpful hints on how to increase welding efficiency on all metals with low temperature welding, as well as instructions for salvaging of vital war production tools. Illustrations and descriptions of typical jobs are given. A special chart has been devised to simplify rod selection and use, reproduction of which appears in the book.

AUTOMATIC STAKING MACHINE INCREASES PRODUCTION With Unskilled Manpower!



Outperforms conventional Riveters on numerous jobs.

A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

	1	1-B	2
Stroke	2"	2"	21/2"
Spindle	1"	1"	11/4"
Throat Depth	43/4"	43/4"	81/2"

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TAKE A HASKINS

There's only one answer where a portable tool of constant power is indicated—Haskins Flexible Shaft Equipment. Light and easy to handle, yet sturdy and dependable, it will turn out more work and better work—faster. Fatigue is negligible. Thirty models, each capable of handling many different jobs. Write today for your copy of Catalog 45. R.G. Haskins Company, 623 So. California Avenue, Chicago, Illinois.



TYPE A-STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

No.	Range of Bores Taken	Net Price
1A	1/2" to 1"	\$12.00
2A	I" to 11/2"	16.00
3A	11/2" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00



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NICHOLSON E-X-P-A-N-D-I-N-G MANDRELS

W. H. NICHOLSON & CO. 117 Oregon St., Wilkes-Barre, Pa.



TYPE B-STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

No.	Range of Bores Taken N	let Price
lx	1/2" to 9/16"	\$10.00
2x 3x	9/16" to 21/32"	11.00
3×	21/32" to 3/4"	12.00
00	3/4" to 7/8"	14.00
o	%" to 1"	16.00
1	1" to 11/4"	18.00
2	11/4" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 21/2"	40.00

(Other Sizes Taking Up to 7" Bores)

Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin No. 1043.



Quickly absorbs its cost in speedy, accurate dressing of surface grinder wheels. A precision diamond tool. Write for Bulletin 758 F

FLORIAN MEG. CO.



BURGESS "P" TACKER

How closely new improvements in mechanical devices touch the average home is illustrated in the tagging of crates by fisheries and in the fastening methods of food cartons. A new and revolutionary development of a jam control release mechanism on the "P" type hand tacker is offered by Burgess Fastening Equipment Div., Lake Erie Chemical Co., 2202 Scranton Rd., Cleveland, 13, O.



Cold storage warehouses find it advantageous to staple identification tags on crates of eggs, boxes of canned meats and other packaged food. Shippers are fastening insulation in freight cars with these machines, and war plants are using them in their shipping room tagging and mailing operations. The factor of loss elimination by reason of secure tagging is especially important during the current situation.

DIAMOND CUT-OFF BLADE

Oscap Mfg. Co., Inc., division of Diamond Tool Replacements, Baltimore, Md., announces production of a new Metal Bonded Diamond Impregnated Cut-Off or Slotting Blade. It is claimed that this sawblade will do a job which ordinary blades will not. It cuts or slots Tungsten Carbide, Tempered Glass and other similar materials, thereby salvaging damaged tools. Because it is made of a special alloyed solid metal, this sawblade is said to be completely safe, eliminating danger of flying pieces. The diamonds are cold welded in place.

The Oscap blade is made in these hole sizes:— $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, and $\frac{1}{2}$. An .042"cut is made by the $\frac{3}{2}$, $\frac{4}{2}$ and $\frac{5}{2}$ Diameter blades, while the $\frac{8}{2}$ diameter makes an .047 cut.

NEW SAW GUN

ONLY QUICK SHIPMENTS ON AA-5 PRIORITY OR HIGHER



FILES and SAWS

Faster - Easier

DOES THE WORK OF SEVERAL TOOLS

Here's one of the greatest tools ever offered to industry.. the New SAW-GUN. It does away with numerous time-consuming operations that formerly required several tools.

Attach the Saw-Gun to an electric drill, or propel it with compressed air or flexible shaft. Insert a broken hack saw blade and let 'er go. It will quickly saw light and heavy gauge metals, stainless or menel, corrugated or plain. A natural for panel notching in metal, wood and plastics. Reaches into spots impossible with any other tool. Filing operations are accomplished in the same manner. It's portable . . carry it quickly to the job. Automotive industries — metal and woodworking plants — in fact, any place where sawing or filing must be done — the Saw-Gun should be standard equipment. Orders and re-orders from America's largest industries offer convincing proof that the Saw-Gun is indeed a great production tool. Sold on money-back guarantee.

See Your Jobber or Write Direct for Quick Delivery!

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A number of territories open to sell on commission basis outstanding Machine Tool Accessory line. Also a Flexible Coupling of exceptional merit. Write giving full details as to present connections and past experiences. All correspondence kept confidential.

Address replies to Box B-10

c/o Hitchcock Publishing Co. 542 S. Dearborn St., Chicago 5, III.



CHASER GRINDING FIXTURE

A new universal chaser grinding fixture has been introduced by The Oster Mfg. Co., Cleveland, Ohio.

The fixture is designed for easy mounting on the table of any conventional tool and cutter grinding machine and is adjustable for any throat or rake angle desired. It will hold all sizes, makes, and types of dies or chasers. Overall size of fixture is 5½ x 5½ x 5% x 9" (unboxed). Net weight is 25 lbs. Shipping weight is 35 lbs.

Accurate grinding said to be assured by the fixture, saves costs of replacing dies and chasers which are often ruined, either from lack of proper grinding or from too long use between grinds.

either from lack of proper grinding or from too long use between grinds. It also eliminates need of purchasing duplicate sets of chasers where the practice is to return worn chasers to the factory for regrinding. Another advantage thru more frequent grinding, encouraged by availability of the fixture, is avoidance of wear and tear on threading machines caused by heavy strain imposed by dull or broken chasers. Unnecessary costs of re-threading pipe or bolts cut by dull chasers is claimed to be another advantage accruing from proper use of the chaser grinding fixture.

COMPLETE GRINDER SERVICE

The complete line of DoAll Surface grinding equipment, accessories and supplies manufactured by the Savage Tool Co., Savage, Minn., is pictured and described in their new 20-page booklet.

The booklet shows the importance of unity when extreme accuracies and fine finishes are to be achieved in surface grinding operations. To accomplish these requirements of precision surface grinding, they offer three hydraulically operated grinders ranging in capacities from 7½x21 to 10x24" capacities. This wide range provides machines for tool room or production work.

With these surface grinders, it is claimed that unity of control thruout the whole grinding process is provided with the specially designed and constructed DoAll grinder accessories. Specifications and application data are shown as applied to either tool room or production grinding.

Among these accessories are grinding wheels, selectron and electromagnetic chucks and the wet or dry grinding attachments including a specially prepared soluble oil for wet grinding.

The Selectron controls the amount of magnetic power being transmitted by the Chuck and also demagnetizes the chuck when work is to be removed.

This unity of the grinding machine to

REYNOLDS Coolant Units for Machine Tools

No. 208 (left) Approximately 15 gal. capacity P.M. Tank 20'x16'x 16'', ½ M.P. meter, For grindler machines, multiple spindle drills. \$86.50 each for the 110 volt, i phase medel, and 220 volt, 3

"KEEP 'EM COOLER IN ACTION'

phase model, \$112.00 for the 550 volt, 3 phase model. 7 gal. capacity P.M. 16"x10"x 7 gal. capacity P.M. 16"x10"x 11" tank. ¼ H.P. motor. For Milling and Screw Machiees, Lathes, etc. \$98.50 each for 110 volt. 1 phase model, 220 volt. 3 phase model, 550 volt, 3 phase model \$108.50.



REYNOLDS MACHINERY CO., 211 EDDY ST., PROVIDENCE, R. I.



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GEAR HOBBERS

... for Accuracy and speed in hobbing PINIONS **GEARS** and SECTORS

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to diam.

No. 1 SPUR and SPIRAL GEAR HOB-BER for work up to diam.

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TRIPLEX MACHINE TOOL CORP. Exclusive Sales Agents 125 Barclay St. New York 7, N. Y.

Manufactured by The Hamilton Tool Co. Hamilton, Ohio



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MACHINE WORKS HARDWARE DIVISION

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the grinding wheel, chuck and dust control is one reason why the company sends out with each Surface Grinder, a test bar showing the extreme accuracies of that particular grinder which results from such a combination.

Also shown are the production methods used in the manufacture of surface grinders and a brief description of the Precision Gage Blocks and Instruments manufactured by this company.



DI-MET DIAMOND ABRASIVE WHEELS

Felker Mfg. Co., Torrance, Calif., has issued a descriptive and illustrated 24-page folder containing detailed information on the use of their resinoid bonded diamond abrasive wheels. The first few pages are devoted to data on the varieties of wheels, numerous applications where thew may be used, facts about minimum wear, economy, and sizes, etc. Included in the booklet are several pages of operating instructions and explanations of type designations.

"TIPS AND CHIPS"

An attractive, new publication has been issued by Kennametal, Inc., 135 Lloyd Ave., Latrobe, Pa. It devotes 12 pages to a story of the development of Grayson-Kennametal specialized c a r b i d e tipped milling cutters, which have been responsible for some startling new milling performance records. Actual shop set-ups are shown and a considerable number of suggestions and recommendations are given. Copies of the bulletin will be sent on request.

JESSOP STEEL CATALOG

The Jessop Steel Co., Washington, Pa., pioneers in stainless-clad and other composite steels announces publication of a new catalog on Jessop Stainless-Clad Steel.

Included is information on analyses, applications, manufacture, fabrication, styles of heads and standard size of sheets and plates. It also gives a comprehensive explanation of the exclusive patented "assembly method" used in producing Stainless-Clad.

Of special interest to fabricators contemplating use of this composite metal are sections on deep drawing, grinding, polishing, cleaning, gas-cutting, riveting, soldering, welding, etc.

SUNDSTRAND MILLING BULLETIN

"Milling Small Parts on the No. 1 Hydraulic Rigidmil" an instructive 12 page booklet No. 1-1, has recently been issued by the Sundstrand Machine Tool Co., 2535-11th St., Rockford, Ill. A number of typical jobs are illustrated. Descriptive information, features, advantages, specifications and dimensions of their milling equipment are contained in the circular, which is available upon request.

CARBIDE TOOL BROCHURE

An attractive and interesting 58-page, loose-leaf brochure entitled "Manual of Carbide Tipped Tools" is being offered by Carbide Fabricators Co., Royal Oak, Mich. This attractive catalog contains pictures and illustrations of their extensive line of lathe tools, reamers, end mills, core drills, and centers, together with an unusual compilation of helpful engineering data.

MATTISON BACKSTAND IDLER

A new four page circular describing their No. 135 Backstand Idler has been issued by Mattison Machine Works, Rockford, Ill. It states that thru the use of this unit, present grinding and polishing lathes can be adapted to the use of factory-coated abrasive belts at a small investment. Stand is placed at the rear of the lathe, permitting use of an abrasive belt running over a contact roll or wheel of the lathe, and traveling back around the idler pulley.

The circular gives details of construction, and contains a number of installation pictures, together with data and results obtained. In addition, other types of polishing and grinding equipment is illustrated. Copies are available upon request.





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- . 6 CUTTERS MILLING CONSTANTLY . . .
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Quick Boring



Universal Mikro-lok Boring Bars are designed for finishing cuts where extreme accuracy is required. Especially adapted for boring to a shoulder, or to the bottom of a hole or where intermittent cuts are being taken. Extremely rigid. Easily and quickly adjusted like a micrometer to limits of .0005 or less. Available singly or in sets. Write for facts and prices.

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SIGOURNEY M-100

FOR CRITICAL DRILLING

● The Sigourney M-100 is a precision drilling machine giving the highest degree of accuracy in fine tolerance work. Heavily built to withstand the wear and tear of today's continuous production schedules... smooth operation assured by sealed ball bearings... hardened and ground spindles for long life... moving parts enclosed for maximum safety... speeds 4000 to 10,000 R.P.M... available in 1, 2, 3 and 4 spindle models.

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COUNTERBORES

The improvements that continue to be made in counterbore design are of interest. A case in point is a type of tool which has been called a continuous pilot counterbore. It bears this name, because the pilot extends without interruption all the way thru the fluted portion of the tool. This is spirally fluted, producing a long spiralling chip.

The construction mentioned permits the pilot head to be cut back progressively, from time to time, as the cutter flutes are ground back for sharpening. This allows almost the entire tool to be utilized.

and still a perfect pilot head is exposed at all times. As a result, a very high degree of tool economy is realized.

On counterbores of the interchangeable type, it is interesting to observe the different methods by which manufacturers guarantee positive and trouble-free drive between holder and cutter.

On e four-fluted type of counterbore has four lands which fit into notches provided in the holder, thus furnishing a positive drive. These are to be had in sizes varying from \$\frac{1}{2}\$ to \$\frac{6}{2}\$ "diameter.

Interchangeable counterbore assemblies as made by another firm will accommodate cutter units all the way from ¼ to 5" diameter. The drive on these is provided by making a hexagon socket in the holder, to receive a hexagon milled on ends of the cutter shanks. All counterbore cutters made by this firm up to and

including 1¼", may be had in either three-flute or five-flute form, but above that diameter, all of them are made with five flutes. All cutters up to 3" diameter are kept in stock. Above that size they are made to order.

A clever method of furnishing a positive drive between a counterbore cutter and the holder consists of providing a stub taper socket in the holder, and a taper shank to mate on the cutter. A vertically-disposed pin is partly embedded in wall of holder socket. Tapered shank of cutter is grooved to fit over the projecting pin.

FELL PRECISION LEVEL



A precision "all-way" level for use in machine tool building, acting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005* per foot and form squares about a circular bubble, thus giving condinate readings and showing the direction and amount of slope, if any. Made in two sizes—
5½*x12*,3¼*x0*.

Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY 700 South St. Rockford, III.

* THE * WONDER CUTTER

Small enough to go in any out - of - theway place — yet it cuts wire

and rods up to % in. round (%-in. square) and band iron up to %-in. by 2-in.

Adjustable stop for gauging the length of pieces. Hardened cutters that last indefinitely.

Get the "dope" on the lowest priced cutter out-

THE WONDER

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WILLEY'S TORPEDO TYPE WHEEL DRESSERS



Many scientifically spaced layers of natural diamonds, securely anchored in a proven matrix that holds each stone securely, until the last stone is used. Unequalled in

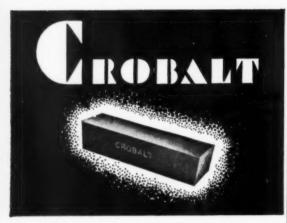


performance and low-cost dressing. Available in four sizes, to meet your wheel dressing requirements.

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway.

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A NON-FERROUS HIGH SPEED CUTTING ALLOY WITH THESE ADVANTAGES:

- Hardness at high temperature
- Superior abrasion resistance
- Superior resistance to impact
- · Freedom from chipping
- Available in solid tools or inserts
- Requires no change in equipment

Write for catalog and prices.

CROBALT INC.

SPEEDING WAR PRODUCTION

Altho steam engine ship drives were outmoded years ago, the first of the exceedingly valuable destroyer escort vessels were equipped with reciprocating steam engines. They could be obtained months earlier than the more efficient turbines, or gears, or electric generators and motors, according to Westinghouse engineers. Normally an undesirable move, last summer with the battle of supply lines in the balance, unquestionably it was good engineering.

Much of this sort of thing is being done in this war. It is surprising that much of it represents not a loss but a gain. There has been a reduction in critical man-hours required, thus helping to win the all - important battle of time.

One change alone is making it possible for available hobbing machines to turn out 26 instead of 14 sets of main gears for Victory ships, or nearly twice as many.

This was accomplished by rearrangling the gears in a
"nest" to eliminate
space between the
two helices of the
big, nine-foot diameter main gear,
popularly known as
the bull gear.

Teeth on the two helices can now be rough and finish cut simultaneously by the two heads of gear - hobbing machines. Separate series operations were necessary when gears were separated by about 30". Now a bull gear can be cut in about six days instead of 17. Additional factors are an increase in speed and an increase in tooth loading.

This change also resulted in simplifi-

cation of gear case bearing supports. This method of nesting rotating parts in gears is not new. It was used in the successful Westinghouse gears employed in propelling Coast Guard Cutters of the Spencer class. To avoid use of a third bearing on the first reduction pinions, the center body between helices has been increased in diameter sufficiently to keep bending deflections within desirable limits.

Another advantage accrues from this nested gear arrangement for ship propulsion. The second torsional critical speed—the potentially serious speed—is well removed from full speed rpm of ship.

PRECISION ROTARY TABLES



9" - \$ 97.00

12" — 160.00

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18" — 350.00 HEAVY DUTY

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BEVERLY HILLS, CALIFORNIA

GRINDING WHEEL DRESSERS

Most mechanics recognize at least two reasons for dressing grinding wheels. There are really three. One of these, where relatively hard wheels are being used for free-hand or rough grinding at regular wheel stands, is simply the removal of dulled and glazed grits still being held by the bond. This allows the wheel to again present a sharp cutting face to the work.

Another is the reduction of the wheel to the point where every part of its face travels within one circular path, known as the cutting cir-

The third reason, found in connection with many grinding machines and grinding projects, is the necessity for forming the wheel face, in or-der that it may generate a certain shape on the work. The shape generated on the wheel by the dressing tool must be in reverse, of course, to that wanted on the work.

The Huntington type of grinding wheel dresser, has been used for dressing of a brasive wheels. It is especially useful in cases where the requirement is the removal of glazed grits, the truing of the wheel with a straight face, or the dressing of some external angle or curve on the wheel face, to produce an internal angle or curve in the work.

Dressers of this style are made and sold by various firms. They

consist of a number of star-pointed wheels of small diameter, spaced on a pin, with washers between them. The little wheels are free to revolve as they are placed into contact with the revolving abrasive wheel. Some companies make this style of dresser in both light and heavy-duty types. Others provide them with cutters or star-pointed wheels made of high-carbon tool steel.

Another style of grinding wheel dresser which has a moving element or cutter, is interesting, in that the cutter is abrasive, the same as wheel being dressed.



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By examination—by comparison—and especially by use—you will discover that Schrillo standard and special cutting tools will improve the accuracy and efficiency of your production and that Schrillo master, reference and working gages will guarantee perfect interchangeability of parts. When ordering, it's "Certainly Schrillo."



BLOWERS

So many different kinds of blowers have been developed for shop duty that it sometimes is a question as to the proper type to use. Many users employ portable electric blowers for driving dust and dirt out of motors and other tight places.

This is especially true in plants where compressed air lines have not been fitted with water and dirt separators. Blowing a slug of accumulated moisture into a motor with the compressed air used for cleaning, does not do it any good. The portable electric blower is always per-

fectly safe from this standpoint. Some manufacturers furnish them in models that can be used either as blowers or suction cleaners. Used in reverse as suction cleaners, they allow dirt to be drawn from the bottoms of bins or other containers such as drawers.

Blowers are needed in connection with ventilators. In some cases where dirt positive-ly must be excluded from a certain area, as in rooms where delicate instruments are assembled, a combination ventilating blower and filtering unit for the air is used.

There are firms which supply such ventilator filters, as well as special man-cooling fans for operators that must work in exceedingly hot places. In addition. they manufacture heat - killer blowers for directing a very strong and high speed blast for cooling furnaces, or for cooling and drying motors, generators, and

various types of products. Certain die and tool steels are best quenched in an air blast for hardening. Blowers of this type are excellent for such service in many instances.

Just as excess heat is sometimes disposed of as cited, by directing a blast of air to dissipate it, so it is often removed by using a blower system which carries it outside. In an exhausting system, there is a suction leg and a pressure leg. The blower is contained in a housing, and exhausts the air from the housing by blowing it thru a pipe to the outside. Thus a vacuum is created.

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MODEL K BALANCING STAND

THE POPE MODEL K BALANCING STAND and ARBOR and the POPE BALANCING WHEEL HOLDER provide convenient means for quickly and accurately securing a satisfactory balance. You will be surprised and pleased at the resulting improvement in your grinding finishes.

Suitable as illustrated for the balancing of grinding wheels up to 8'' diameter, 34'' width, and 114'' hole.

POPE MACHINERY CORP.

HAVERHILL, MASS.



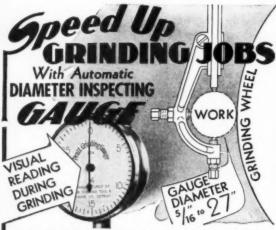


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I MAGINE being able to cut 6½ feet of 14-gauge sheet steel per minute— and lighter gauge steel at a still faster rate! Compare this with the time it is taking your men to do it the old-fashioned way and you will realize that the labor costs saved by this electric tool will pay for it in a remarkably short time.

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WRITE FOR LITERATURE Jefferson Engineering & Mfg. Co.
269 Walker Detroit 7, Michigan



Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

DIAMOND TOOL & GAUGE CO.

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AIR LINES

Aircraft traffic routes are not meant. Reference is made to pipe lines for handling compressed air as used in modern factories and industrial layouts. Progress is being made in various ways with regard to these air lines.

One device which is being connected into air lines more and more frequently is a strainer. It can be used in either pipe or hose lines ahead of pneumatic tools, to keep entrained dirt from getting into the tool mechanism. As made by one firm, the device is easily cleaned, by simply removing a read ily accessible

threaded plug, and turning on the air momentarily, thus blowing out trapped dirt.

The same company also makes an efficient air line lubricator. This device couples directly into the air line and holds a pint of lubricant. It will automatically feed any lubricating oil or liquid grease which will flow at the temperature at which the lubricator will operate, atomizing the ma-terial and throwing it into the air stream. In this way. it is carried into the air - operated tool being used, keeping it lubri-cated effectively.

In some cases, the functions of a strainer or separator and an air line lubricator have been successfully incorporated into a single device. This is known as an automatic air line lubricator and filter. It effectively removes foreign matter including dust, pipe scale and moisture, from the air stream, after which it saturates

desired volume of oil. It is convenient to apply where both results are sought in the same air line.

There are always some places where air lines must be run thru unheated areas, and at times air-operated tools must be taken out into the open for operation. This sometimes gives rise to trouble, due to moisture in the lines freezing in either the air lines or the tools.

In such cases, the logical remedy is application of an anti-freeze system, in the form of a tank-and-valve assembly that can be coupled into the air line.

No. 2 To No. 6

Screws Driven on this Husky but Sensitive Hopper Feed Screwdriver.

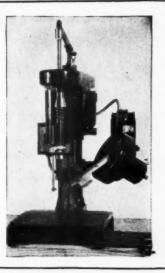
No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.

DETROIT POWER SCREWDRIVER CO.

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EMERY WHEEL DRESSER



A mechanically correct dresser with cutters made of steel of our own specification — the result of years of specialized study and manufacture of cutters. Cutter set provided with revolving sleeve that turns uniformly and prevents grooving of spindle. Patented spindle bearing. Also patented handle cap that serves as bearing clamp, eliminates set screws and eliminates moving parts that wear. The Champion Dresser will outwear many cheaper dressers . . . a fact proved for years by thousands of shops.





HEADING DIES

Heading dies require more care in a number of respects, in their making, than many other kinds of dies. Their function is peculiar, and for that reason it is well to exercise some care in the choice of a material for making them.

It makes a difference whether the work is to be cold headed or hot headed. Really, it is advisable to obtain suggestions from the steel manufacturer as to which of his steels is best suited for this purpose, and what performance, if any, he will guarantee them to give. One firm makes a special cold heading die steel,

and also offers a sintered carbide that is suited for heading work.

The heat treating of header dies is very important. One manufacturer of heat treating furnaces for tool steels has emphasized the importance of heating dies without any scaling, carburizing or decarburizing, and also need for special treatment in the quenching.

He suggests flush quenching, with the quenching medium, preferably brine, concentrated on the portion of the die where the greatest hardness is desired. He offers to send sketches showing flush quenching appara-tus which is particularly well adapted for use on heading die work. Tempering of dies afterward is, of course, equally important. Manufacturers offer furnaces well adapted for both treatments.

Small tool room grinders with fittings which adapt them for holding in

the tool-posts of lathes are often useful for grinding header dies of certain kinds, and especially those for production of round heads. One was recently noted in use on a lathe, grinding a heading die for clinch-on nuts. It was made by a builder of portable electric tools.

The finish obtained on a heading die of the solid type is important. The slightest degree of roughness inside the die may cause trouble. Sometimes breakage of the knockout pin will cause difficulty.

One method that has been found to provide a finish superior to lapping, is to use a precision honing machine.

HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.

A)

HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

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MILLING CUTTERS

For getting into tight corners with the vertical milling machine, and cutting small internal radii, very small cutters are required. The cutting edges on such tools do not extend far from the tool body, but they must be highly accurate, and equal in cutting quality to those of larger cutters.

The best way to obtain a good cutter of this kind is to harden and temper a blank first, and then grind it out from the solid.

One manufacturer of these tools hardens and draws them to a Rockwell hardness

of 63-65, and then grinds them from the solid blanks thus treated. Cutters so made produce clean, sharp chips, which are always indicative of a good cutting job.

Face milling cutters of insertedblade type are much used, and offer many economies for various kinds of shops. This is especially true when a really good method of locking and adjusting such blades in the cutterhead has been used.

One firm specializing in the manufacture of this type of cutter, has worked out a method of holding and adjusting the inserted blades. The cutter-head is milled with seats for the blades all the way around, the slots being made with parallel sides. The rear surfaces of these slots (or that sur-face which engages the back side of the blades) is then machined with a series of parallel serrations... These serrations are also placed so they are

placed so they are parallel to the required path of cutter blade adjustment.

The backs of the blades to be used are then machined with a series of serrations that will mate with and engage those in the cutterhead proper. The thickness of the cutters or blades is held at a point where they are an easy slip fit into the cutterhead, when the locking wedges have been loosened.

While space does not allow us to consider the design of the locking wedges specifically, it may be said they are members which are larger at the bottom than at the top.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S.

NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

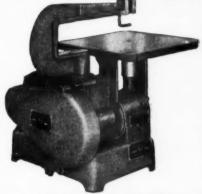
This is a very beavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10° Table; Model E.L. 12° Table;

HARVEY MFG. CORP.

Phone CAnal 6-5170

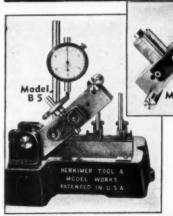
BEWARE OF IMITATIONS!

Our machine carries the Butterfly trade mark.



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Simplified BEVEL GEAR GAUGING



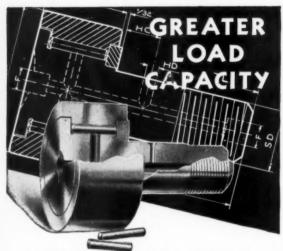
No Difficult Operations, Involved Calculations or Intricate Manipulations,

With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these

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- Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.
- 2. Check accuracy of cone angle.
- Check run-out of gear face.
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HERKIMER TOOL & MODEL WORKS, 1010 George St., Herkimer, N. Y.



McGILL Cam Follower Full Type Roller Bearings have a greater load carrying capacity for a given over-all width, and occupy relatively little radial space, as compared with plain bearings and ordinary ball bearing cam followers. Added advantages include effective sealing and the absence of small retaining washers or otherwise delicate extra parts. McGILL Cam Follower Roller Bearings are made in a variety of sizes. Write for Bulletin No. CF-40A.

BEARING DIVISION - 1700 N. Lafayette St.

Manufacturing Co., Inc. Valparaiso, Indiana

COPPER

Copper has many advantageous uses, some of which are very well known, and some not so well known. The resistance it offers to corrosion when exposed to the weather, the efficiency with which it conducts heat, and the ability it has for ready conduction of electricity are some of the things for which it is best known.

Some have difficulty in obtaining specific types or forms of copper at times, not realizing that there are firms who are copper specialists. They are able to furnish anything from copper tacks and wire cloth to angles, channels or roofing

accessories.

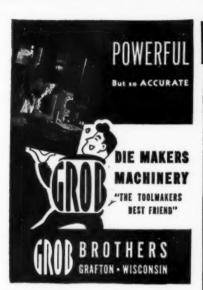
Regardless of the fact that copper resists severe corrosion when exposed to weather, it is not immune to the extent that it will not discolor. In fact, copper discolors very readily and quite badly when exposed to the air.

It is interesting to note, in this respect, that special means are taken in the case of some copper products to protect them from becoming unsightly thru such discoloration. A case in point is newlydrawn copper wire. A lubricant of some sort is used in drawing the wire, but not enough of it is left on the material after the final drawing to protect it against discoloration.

One of the manufacturers of drawing lubricants has made a special soap to solve this problem. Into a solution made from this soap, the coils of newly-drawn copper wire are dip-ped. They are then placed into a centrifugal machine. where all excess solution is thrown

off. After this they dry by their own heat, for the solution into which they are dip-ped is hot. This process leaves a fine bright finish on the wire.

Some years ago it was discovered that when the surface of iron or steel is impregnated with copper, a lubricating effect was obtained on that surface. This discovery has been utilized at different times and in a number of ways. One of these has been the application of a copper plating to automobile camshafts, to serve as a lubricator plating between the cams and the valve lifters. A special type of automatic plating machine is used for this purpose.



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It has a circular series of laminated, resilient Cantilevers of 200,000 lb. steel operating in taper-side slots. End thrust is impossible: leverage on the cantilevers decreases automatically with increased load: safety stops prevent damage from extreme overloads: special end-float obtainable up to four inches without increase in cantilever stresses: outer periphery can be used as a brake drum for quick-stopping machinery. Over 3,000,000 H.P. in service. SEND FOR BULLETIN No. 28-B.

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TERION MACHINE WORKS ERLY HILLS, CALIFORNIA

MAGNESIUM

Since magnesium presents a fire hazard wherever it is being worked, and yet is so valuable in many types of modern equip-ment, it has been the goal of industrialists to provide equipment and processes for its handling that will make it safer for the manufacturer.

One remarkable thing that has been done is development of a method of welding magnesium which makes use of helium gas. This is the gas which has proven so well adapted for dirigibles, since it is non-inflammable. It has been found pos-

sible to shield an electric arc with a blanket of inert helium gas, so that air and the oxygen it contains are excluded. Since oxygen is necessary to sup-port combustion, the helium gas blanket not only protects the weld against oxidation in the ordinary sense, but protects against fire also.

Magnesium dust will inevitably be present in some measure in nearly every location where magnesium is being worked. Where grinding and polishing operations are being performed, it will be present in abundance. This, together with the fact that practically all electric motors can be expected to spark at the brushes now and then, makes the electric motor a hazard in the presence of magnesium dust.

However, there are totally enclosed motors which have been specifically approved by underwriters for operation in

the presence of magnesium dust. Such motors, are designed with built-in fans to keep them effectively cooled.

It is good practice to keep the amount of magnesium dust present in any plant down to as low a point as is consistently possible, and also to take precautions against the throwing of sparks from other sources, as well as electric motors.

In order to combine these functions where grinding, buffing and polishing operations on magnesium are being carried on, one firm has produced a collector booth for magnesium dust.

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Modern precision machine shops and inspection departments will find this sturdy 36"x 48 MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

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INDEX CENTERS

The original and principal idea in regard to use of index centers, is that of providing devices that will permit exact circumferential spacing on pieces of work, so that a number of cuts or other operations can be spaced equally. In this way, using an index center of simple type, one can index six times within one revolution of the work, and mill the six sides of a hexagon nut or machine screw head. He can arrange for four index motions within an exact 360 degrees, and mill the sides of a square bolt head.

In like manner, four or six (or any

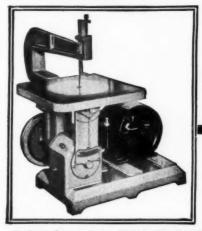
other number provided for by the index centers being used) grooves may be milled I on g i t u d inally around a shaft or other part, so that spline cuts or anything that might be required may be readily machined at equal spacing.

Index centers can be used in connection with many different kinds of metal working machines, tho they find their greatest use at the milling machines of milling machines make a complete line of index centers.

Working on the basic principal that by gearing two or more centers together with gears of equal size, indexing one of the centers will automatically index the others a like amount, some manufacturers have specialized in the production of multiple index centers.

These are made up with a number (usually three or four) of head cen-

ters in a headstock, spaced evenly and arranged in parallel, and a corresponding number of tail centers in a footstock. Thus, instead of mounting one piece of work at a time, as on a milling machine, three or four pieces are mounted at once, and are automatically indexed at once. By setting a number of milling cutters on the arbor, spaced to agree with the spacing of the centers, a cut is taken on each of the three or four pieces at the same time. Naturally, a far greater amount of work can be produced in this manner.





Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price Complete With Motor

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F. O. B.

ATLAS EQUIPMENT 103 S. Clinton St., Chicago, Ill.



CHUCKING AND INDEXING FIXTURE FOR USE ON MILLING MACHINES

The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.

Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

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one! 14 Etching heats, 90 to 1350 watts. Cover removable for etching large parts. Demagnetizer has rating of 5.5 gmpere. All parts enclosed when not in use.



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PART TIME WORKERS The nation has an untapped pool of 31,000,000 part-time workers, who should be utilized to alleviate manpower short-ages, Paul V. McNutt, Chairman of the WMC stated recently. True, very little of this great national

reserve may ever be called upon, due to concentration of labor demand in specific areas. Moreover, many individuals are unavailable for a variety of reasons. Even so, the pool is large enough to warrant more serious consideration of part-time programs in all labor shortage areas. In

such areas tapping that pool is a part of the War Manpower program.

Reports to the WMC from plants in major war industries show a growing interest in the use of such labor but as yet use is limited.

The 31,000,000 potential part - time workers are divided into three groups: - (1) Eight million students over 14 years of age—many able to carry part - time jobs. (2) More than 5.000.000 non-working women between 20 and 55 years of age, without child-ren. Most of these can accept fulltime employment but are not able to work more than part-time in addition to maintaining their homes. (3) Almost 18,000,000 workers in trade. service and government - some of whom are able to work a few addi-tional hours a day on a second job.

Of these 31,000,000, only 2,000,000 are working, mostly in trade and service industries. Agriculture and the can-

ning industry have made seasonal use of part-time labor to supplement regular forces. The student, the soda jerker, and part-time sales persons are numerous.

The advantages of part-time work are many. They (a) provide labor force in-creases in areas where in-migration is undesirable because of crowded housing, transportation, and community facilities, (b) help income, applicants for part-time work have been more numerous than the job openings available to them. In some areas, special part-time work divisions have been established.

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of	Opens	Weight
	Jaw, Inches	Inches	Pounds
1D 2D	31/2	31/2 51/2	121/2

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Machine uses No. 5-C Rivett Callet — a popular size which array plants now have. Has single lever control—storts-stope-applies brake, opens and classes callet. Has 4-step V-Belt Drive—Threade8 noce spindle for use of 4" 8-few universal chuck—

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REYMOLDS

211 FORT STREET

PROVIDENCE &



- Every lathe needs a "Multi-Stop" to give it maximum efficiency and accuracy—many shops report 100% increase.
- \$16.50 for all lathes 6" to 13"; \$30.00 for lathes 14" and over, Prices F.O.B. Los Angeles.

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MARSHALL TOOL & SUPPLY CO.

DIAMOND TOOLS

The question as to where to purchase diamond tools is one that has been given considerable thought in many plants. They can be obtained in some cases from firms which specialize in precision gages and tools. One firm making Carboloy-tipped tools and gages, as well as special wear parts, guaranteeing the precision and the quality of their products, is also in a position to furnish diamond tools.

After all, there is a definite relationship between tungsten carbide tools that must be ground, and diamonds, since diamond wheels are much used for grinding such tools, and diamond dressers are needed for dressing all kinds of grinding wheels. Some of the leading firms in the tungsten carbide field not only make carbide tool grinders, including chipbreaker grinders, but also provide diam on d dressers for dressing all grinding wheels.

There is, of course, considerable difference in the design of diamond of diamond of diamond of diamonds are included in one dressing tool. One of these is especially adapted for small surface and cylindrical grinding wheels, or for general toolroom work.

This particular dresser has 11 whole, natural diamonds, set in a matrix by a special process, and in three layers, precisely spaced and staggered. A tool of this kind is not well adapted for dressing wheel contours, but is especially useful for straight dressing.

One must remember, if he has extensive use for diamond tools, that there are diamond

specialists. Such firms, thru continual experience and research, apply diamonds to almost every conceivable duty for which they can be adapted. They are dependable authorities in the matter of the use of diamonds on all regular duties. One firm that comes to mind furnishes all types of diamond-pointed tools for truing and dressing abrasive wheels. They also supply the types required for specific kinds of grinding machines, as well as furnishing diamond wire drawing dies, diamond-charged metal sawblades, diamond writing pencils for writing on steel, glass, etc., diamond valve refacers, etc.

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Bins taper toward front to form convenient semi-circle -keep all bins within easy reach.

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Two sizes—tapered or straight edges. Hoppers available for steady work.

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Silver Soldering or Gas Welding Stainless?

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KREMBS AND COMPANY 676 West Ohio Street, Chicago 10, Illinois

Chemists and Metallurgists Since 1875



CLAMPS

Occasionally one runs across something new in the line of a clamp, that is plainly of more than ordinary merit. One recently noted is a T-slot clamp. This unit combines the functions of clamping bolts, blocking, and clamp straps on the machine table. It can be used on any machine table provided with T-slots. Base of the clamp is several inches long, and is milled to a T-section, so that it will slide right into the T-slot on the table. The balance of the clamp is much like a regular C-clamp in design. Consequently it will clamp directly over the work,

and will save much setup time as compared to the use of other clamping arrangements.

C-clamps made of drop forged steel have their uses in every shop, and are to be had from representative clamp makers in both light and heavy models. They are available in small sizes that are particularly adapted for the toolmaker. or in large shop sizes. Heavy duty shop clamps are made with largerdiameter screws than clamps made for lighter duties. since they must withstand side springing and deformation under heavy thrust.

One of the best C-clamps that has come to my attention is made in such a manner that the clamping screw does not turn as it descends upon the work. It is the turning action of a clamp screw which causes it to "skid" or creep as tightening stightening

takes place. This action is to blame for poor clamp settings, and also sprung clamps, in many cases,

The particular clamp in which the screw does not turn is fitted with a square recess in the elongated hub. The screw is fitted with a square portion which can slide, but not turn, within the hub. On that side of the clamp hub next to the work, a nut is mounted on the threaded screw. By turning this nut with a wrench, the screw is pulled out and into the clamping contact with the work. This particular clamp has a very heavy body that is made of malleable iron.

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Save floor space, save power, and eliminate line shaft expense by installing MODERN MOTOR DRIVES in your plant. All drives are ball-bearing equipped and designed to fit practically every machine tool. Soundly engineered for long life.

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Swivels 360 degrees horizontally. 100 degrees vertically, to give any angle or com-



NEW BRITAIN TOOL & MFG. CO. NEW BRITAIN, CONN., U. S. A.

MPLE JAW DRILL CHUCK



ALMOND Three Jaw Drill Chucks are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some form of machine tool such as drill press, lathe, or milling machine. Also used on portable tools, principally electric and pneumatic drills.

ALMOND Three Jaw Drill Chucks were the first to be placed on the market; they are the pioneers of the field. These years of research and top material going into their production have made them outstanding in the field.

WRITE FOR DETAILS

T. R. ALMOND CO.

ASHBURNHAM.

MASS., U.S.A.



section members such as shafts are to be held in a stationary position, U - bolts of the proper size will do the job, if it is a case not requiring a more rigid assembly than they can afford. The widths of U-bolts between their legs are made somewhat greater than the O. D. of a given pipe they are to support, when made for pipe lines. For instance, a ½" pipe, is a pipe of ½" I. D., and its O. D. will be %". The width between legs of a U-bolt for such pipe is 1" net. Some firms have full lines of standard U - bolts, ranging from sizes adapted for holding 1/4" to 4" pipe. In addition, they will quote prices on any special U-bolts that fall outside of their regular lines.

Since bolts and nuts are used universally and in so many different styles and sizes, there are firms which have taken up this end of the industrial picture as a specialty. Not

only do they furnish ordinary steel bolts in a full line, but bolts and nuts of stainless steel, brass, monel metal, bronze, Everdur and copper are also kept in stock in those items which have a sufficiently wide use to justify carrying the inventory. Aside from these, specials are manufactured if and when desired.

One firm furnishes bolts and nuts of aluminum and of naval bronze, in addition to many other types.

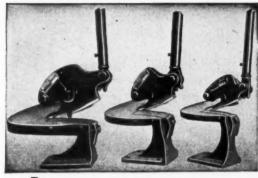
Another large bolt and nut manufacturer not only supplies such items in many different metals, but also hot and electro-galvanized.

BOLTS AND NUTS

Considerable interest attaches to the selection of bolts and nuts that are particularly well adapted for doing a given job. In some cases, they are so highly special that it is a matter of making them in one's own shop, or having them made on special contract.

There are many times when a standard kind of bolt can be adapted quite well. As a case in point we have U-bolts, which without any question have their chief use in clamping or hanging pipe lines of various kinds.

It is evident that where any round-



Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16⁸ mild steel and 10 ga., stainless.

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BALDOR BALL BEARING GRINDERS STURDY BUILT

for Long, Hard Service.





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Above: Baldor Special Carbide Tool Grinder, ½ h. p. ball-bearing motor, 6° Silicon Carbide wheels, Ask for Bulletin 305;

At left: BALDOR Grinder No. 101, 1½ h.p., ball-bearing motor; 1725 r. p. m., 220 volts, 3- phase, 60 cy; 10° Aloxite wheels. (Ask for Bulletin 307).

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justable Counterbore and Spot Facer make it possible to cut all fractional diameters from 9/16" to 5½" with only 8 tools. Adjustments for diameters, even in thousandths, are simple and quick. permit heavier cuts and feeds. Because Clark Blades are adjustable they can be easily resharpened by hand and reground many more times than flued cutters. NO BURR PILOTS. This exclusive feature eliminates troublesome, damaging burrs on hole edge. Simple adjustment converts to efficient BOR-ING BAR. Available individually or in complete sets. Replace the blade, not the entire tool. – Investigate Clark Cutters today!

The same outstanding, inventory-cutting advantages are also found in Clark Adjustable Hole Cutters, Flycutters, Surface Facers and Grinding Fixtures, SEE YOUR JOBBER — WRITE FOR BULLETIN MT-8B-2

In Canada: DOMINION BEARINGS, LTD., Toronto, Montreal, Winnipeg Export: THE AMERICAN STEEL EXPORT COMPANY, INC., New York, Los Angeles

Robert H. Clark Company

SPEED CHANGES

The history of various methods that have been developed for obtaining speed changes on different kinds of mechanisms would be of considerable interest, could it all be reviewed. It is believed, however, that greater progress has been made in this direction during the last decade than ever before.

There are devices for making speed changes thru a very moderate scope, for sometimes this is all that is required. Such means are provided by what are known as variable-pitch sheaves, made for use with V-belts. By means of a simple adjustment in these sheaves, which

takes only a few moments, the pitch can be changed to give an infinitely variable speed alteration ranging from 15 to 25%. Many have made use of this simple method.

Often the problem is not that of having variable speed available, but rather of stepping motor speed up or down to make it adaptable for some specific mechanism that is being driven. In most cases, it is the reduction of motor speed that is desired, rather than its increase, so that many are not even aware that speed increasers, are available. They are pro-vided by a number of firms. One com-pany that specializes in such units has them in both standard and special designs, and in almost any horse-power, to meet any require-ments. Some provide four-speed gear shift transmissions.

Speed reduction units as made by some builders may be had in a number of types. One manufacturer has them in motorized design, in herringbone gear

herringbone gear style, and in a worm gear type. In addition they furnish a variable-speed gear by means of which speed may be directly regulated to any desired point within scope of the device.

Applications for variable-speed units continually are growing in number. Another device that has been considerably used where very high speeds are required is electrical in nature, and is known as a frequency changer. By stepping up the frequency of the current, the speed of the motor is increased accordingly.

Did you know that the speed of pistons in compressed air cylinders is being closely adjusted thru use of control valves?

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Sizes 1/2" to 4" Pipe
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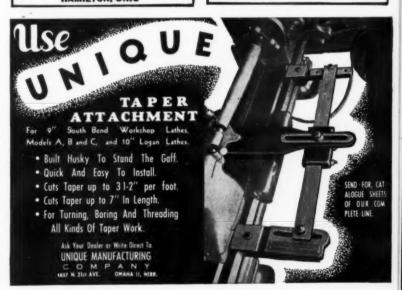
SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table

swivels and locks in any position. Can be varied 151/2" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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MIDWEST TOOL & ENG. CO. 112 Webster St., Dayton, Ohio





TIN PLATING

A ribbon of steel swirls thru a maze of machinery and chemical baths at 1000 feet a minute, emerging with a shining coat of bright tin in a new, continuous electroplating process that is aiding the tin plate industry by producing material for cans many times faster than older methods permitted.

It is estimated that yearly savings of tin resulting from use of this process would total 1,200,000 pounds.

Known as the Halogen Tin Process and developed by the Electroplating Division of E. I. du Pont de Nemours & Co., this is one of the latest contributions of industrial science toward "better means for quicker victory". It speeds up production of the tin plate so essential for the manufacture of food containers.

The new electrotinning method, one of the largest installations of which is now operating at the Weirton Steel Corporation, Weirton, Weirt

Electroplating processes lend themselves to more accurate control. Hence, the new method applies coats in the exact thicknesses required to meet specifications which may be varied according to use for which the product is designed.

Operation at
Weirton was made
possible by use of the new Halogen Tin
Process, successful development of which
was the result of close cooperation between the steel company and Du Pont.

The flexibility of continuous tinning, moreover, promises to launch the process on an even wider course of post-war development when the coming of peace brings relaxation of restrictions on use of tin. Halogen Tin electrolyte is equally effective for depositing heavy or light coats. After the war the Halogen Tin Process will offer means of depositing coats in whatever weight the package industry may demand.

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CHICAGO Adjustable LIGHTS

"SPOTS-LIGHT WHERE IT IS NEEDED"

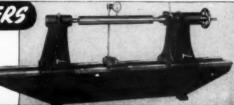
No. 2000-1 Bench \$5.40 ea. \$5.10 ea. \$4.80 ea. No. 2000-2 Wall \$5.55 ea. \$5.25 ea. \$4.95 ea.

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BENCH CENTERS

Removable Centers are tool steel, hardened and ground. Equipped with screw tailstock. Made in sizes to swing diameters of 12", 18", 21", 24", with base 36" and 48" between centers.



MICHIGAN DRILL HEAD CO.

971 E. 8 MILE ROAD HAZEL PARK, MICH.



X-RAY APPLICATIONS

Wartime applications of X-ray equipment to industrial inspection developed by engineers of Kelley-Koett Mfg. Co., Covington, Ky., are helping speed the production lines in novel ways.

When a manufacturer of metal-housed electronic tubes found his production included an exceptionally large number of unsatisfactory tubes, not discoverable until failure in actual use, he turned to X-ray. Position of the numerous elements in electronic tubes, including filaments, plates and grids can be determined visually when enclosed in glass. When the hous-

ing is of a non-transparent metal, such visual observation of defects is not possible.

By X-ray, this tube maker can see thru the metal housings as easily as tho it were glass, catching internal defects before shipment.

In another instance. a switch manufacturer faced the problem of determining whether internal construction of the product, housed in molded bakelite, was satisfactory. By X-ray, it could be determined if contacts were correct without cracking housings open. At the same time, each individual unit could be inspected without destruction, eliminating "spot checking", a less thoro procedure.

X-ray is also helping a diamond cutter check his work. Many delicate navigation and electronic instruments used on ships and planes, as well as in electrical measuring devices require use of ultrafine wire, dra wn frequently to one-tenth the diameter of a human hair by

use of diamond dies. Firmness with which the die is held in its alloy casting is a cardinal point in construction and because of its small size, anchoring is a difficult procedure.

Diamond dies, previously imported, were unavailable after the start of the war. It became necessary to develop a domestic supply.

A Cincinnati diamond cutter has been able to develop a special casting technique that has provided more than adequate replacement of the foreign dies.

X-ray pretesting of castings is another important application.



SAVES LABOR

You will eliminate many costly hours from your Payroll by using the JACKSON TIME-SAVING VISE. It saves the time wasted by your Machinists in hunting for Bolts, Clamps, Angle Plates, etc., when rigging up work on the Drill Press, Miller, etc. Of still greater importance is the saving in output you effect by not having your productive machine standing idle during the rigging up process, for the—

JACKSON TIME SAVING VISE

by means of its revolving jaws and supplementary jaws instantly holds the thousand and one shapes that arise in machine work.

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The CRITERION Carbide Tool Grinder

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Provides positive capid adjustment is meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant agreem. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment. One 60 and one 100 ant 7° day steel backed.

silicon carbide wheels Ideal

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De-Sta-Co spacers save a lot of time when setting milling machine cutters . . . they do away with much idle machine time and thus increase production . . . they are offered in all standard arbor sizes and in thicknesses from .001" up, including long spacers cut from bar stock and ground to decimal . . . they are made from metal and therefore are not affected by temperature changes . . , they may be used over and over again, which makes them the lowest in cost of any arbor spacers you can buy.

SEND \$1.00, giving us size of your arbor, and we will send you a special trial assortment of spacers, sufficient for average use on a machine.

DETROIT STAMPING CO.

PRESERVING ZINC COATINGS

Millions of dollars have been spent on paints, finishes, and treatments to delay the inevitable rusting or oxidation of metals, according to Westinghouse engineers. Conspicuous success has been achieved by treating metal surfaces with phosphoric acid solutions to increase paint adhesion.

Zinc remained stubborn and would not take the phospate coating evenly in the ordinary phospating process. Early in this work a curious phenomenon was discovered. If the zinc surface is wiped with the hand, a brush, or a cloth before it is treated, excellent phosphate coating results. Just why this happens is not altogether clear. Nevertheless, many methods of wiping the zinc surface before treatment were attempted. In production, however, uniform wiping is difficult even on plane surfaces — on irregular objects it is impossible.

In manufacturing zinc - plated frames for outdoor - type watthour meters this problem of preparing the zinc surface to take the protective coating of paint became serious. A young Westinghouse chemist tackled the problem. He proposed doing the wiping chemically instead of mechanically.

Countless dips were tried with indifferent and inconsistent results. One day he tried disodium phosphate with excellent results that could be duplicated as long as that particular batch of phosphate lasted. With the next lot of disodium phosphate the result was a failure. Obviously, there was something different bottle of phosphate

about the previous bottle of phosphate, but ordinary chemical tests revealed no difference.

Finally in desperation a more critical test was made and a faint trace of titanium—one part in a million—was found. Therein lay the answer. For some reason a mere whisper of titanium is the magic that makes the pre-dip solution of dissodium phospate work as a chemical wipe on zinc for subsequent and final phosphating treatment.

The process is now being applied extensively on a commercial scale for protection of zinc-coated machine parts.





SAVE TIME ON INTRICATE ANGULAR SET-UPS .

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

WRITE FOR INFORMATION

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38,000 RPM For Heavy Duty Grinding

This 5 lb. Onsrud E-1 Air Turbine Grinder develops ½ HP for fast, heavy duty grinding. Designed for ½" to 1" diameter grinding wheels, the 38,000 RPM give the wheels the peripheral speed at which they work best.

Like all Onsrud Air Turbine Grinders the E-1 runs for hours at less than room temperature. Stalling or overloading cannot damage the tool. Onsrud Grinders can save time and money on all your portable grinding work. Write for complete Air Turbine Grinder Bulletin.

ONSRUD MACHINE WORKS, Inc.

3908 Palmer Street

Chicago 47, Illinois



MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

SMALL WORK

The production of very small work involves problems all its own. It is obvious that standard machines and equipment used for handling work of larger size cannot be used on small work to any degree of advantage.

Consequently, machines and devices have been developed for just such work. The watchmaker's lathe, for instance, is suitable for any kind of very fine work, whether it enters into the making of a watch or not.

Some firms that make excellent lathes of this kind, are also builders of tiny

milling machines known as micromills. Designed especially for small work, they are a natural team mate for the watchmaker's lathe.

A semi - automatic machine for cutting spur gears and pin-ions no coarser than 32 diametral pitch, is undoubtedly the baby among gear cutting machines. Gears may be cut in multiple, in a stack an inch long, if de-sired. For cutting pinions such as are used in small clocks. watches, meters and like work, a maga-zine feed can be applied to this little machine to make it fully automatic. The company producing it, incidentally, is in a position to build all kinds of small special machinery to order. Thus a ma-chine may be obtained for nearly any kind of very small work.

For high production of tiny round parts, either a Swiss type of automatic screw machine of very small size. One of the latter requires a space of only 10x30", ex-

clusive of the feed tube, so one can appreciate that here is a very small screw machine. It may be had in either a bench or a floor-mounted model, and is used in the manufacture of parts for business machines, clocks, electrical appliances, watches, sewing machines and like work. The maximum spindle speed on this machine is 15,000 rpm.

Tiny ball bearings are an interesting study. They are made as small as $\frac{1}{2}$ outside diameter by at least two manufacturers. The bulk of these tiny bearings are believed to be going into delicate mechanisms used in high quality aircraft.



DIAMOND SIME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. 'Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.





LITTELL Automatic Centering Reels are constructed with four arms which operate all at the same time. A free loop of material is supplied to automatic feed, regardless of which to find

gardless of weight of coil.

Littell Reels are made in 100-lb. to 20,000-lb. capacities. Automatic spindle and cradle types. Plain and motor-drives. Used in thousands of plants for faster

production.

Other Littell products include Roll Feeds, Dial Feeds, Magazine Feeds, Air Valves, Straighteners, Scrap Winders, Pres-Vac Safety Feeders, REQUEST REQUEST BULLETINS.

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THREAD GRINDING

Also Internal, External and surface grinding.

MAGNETIC INSPECTION

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ADJUSTABLE SNAP GAGES IN STOCK Model A

Immediate delivery .025" to 7"

PROMPT DELIVERY ON PLUG GAGES .125' to 8'

Extraordinary Improvement in Adjustable Snap Gages with Ball-tipped anvil and amazing positive locking system cannot get out of set.—Pat. Applied for.

GOOD Prevent Spoilage Utilize Less Skilled Help GAGES Speed-Up Operations Reduce Costs

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AN AMAZING IN AN ELECTRIC HANDTOOL

WEIGHING ONLY

SPEEDS UNDER LOAD TO 35,000 R.P.M. USE IT WITH OR WITHOUT ATTACHABLE COOLFLEX SHAFT

Use PRECISE 35 for grinding, milling, drilling, sharpening, de-burring, finishing, and a hundred other ways. Use it on steel of all characteristics, non-ferrous metals up to 350 Brinell hardness, aluminum, plastics and other materials,

Works faster and smoother because PRECISE 35 packs more power and speed per as. of weight than any other electric handstoolf Less operating pressure reduces frictional heat—saves were on cutting tools by as much as 50%. No heating of tool or surface and guaranteed shockproof without ground wire. Operates on AC or DC and mounts in stand, vise, or lathe.

Strong, lightweight Bakelite case fits the hand—women hold it long hours without fatigue. Four ball bearings in balanced alignment are sealed in protecting grease chamber. Patented overload switch cuts off current when tool is abused.

For close and difficult work attachable COOLFLEX flexible shaft extends full power and speed of PRECISE 35 to cool-running handpiece weighing only 9 oz. Only PRECISE 35 offers attachable flexible shaft running at 35,000 R.P.M.

WRITE FOR BULLETIN NO. 02

PRECISE PRODUCTS COMPANY 1330 CLARK STREET, RACINE, WISCONSIN



IE PRECISE 35

GRINDING DIES

Where considerable die work is to be done and many flat surfaces have to be generated on the work, a good surface grinder is especially useful. Work can be done with speed, accuracy and safety on modern surface grinders.

One in particular has an ample working speed, a plenteous water supply, and ability to use soft, free cutting wheels, all of which are important.

Torch-cut parts for dies are best taken to such a machine for the first operations after cutting. Flatness, squareness and parallelism are all readily maintained,

and this is the very foundation of the work in many cases.

Squaring up die sections is a job that in some shops may be done to better advantage with a grinder especially designed for the purpose. At least one such grinder has been developed, that is a heavy-duty machine on the one hand, and portable on the other. It has a trefoil base fitted with three casters, so the ma-chine, like a threelegged stool, will rest solidly anywhere regardless of irregularities in the floor. It can be moved about the die shop readily.

A grinding disc is carried on a horizontal arbor, and directly in front of it is a horizontal work table. Consequently, since the table is square with the face of grinding disc, any die section held on it and advanced to the disc may be ground perfectly square.

The grinding of cartridge dies has commanded much interest during the last two or three years. For this work, a plunge cut internal

grinder, using a form wheel is especially

Contour die surfaces can be ground on this type of grinding machine on a basis that is entirely automatic, except for loading and starting the machine. Many more dies can be ground using such a machine, and incidentally, it is not necessary to have highly skilled operators to obtain uniform results.

For getting into tight corners in die grinding and similar work, special grinding attachments that can be attached readily to the surface grinder are avail-



Angle plates for boring mills, drills, lathes, grinders, layout, inspectors, vee blocks, parallels, surface and lapping plates.

TATRA TOOL CO.

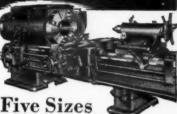
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Cleveland, O.

PRICE: \$150.00.

HYDRATROL LATHES

Large Hollow Spindle Type



(18" TO 36")

Provide Wide Range of Usefulness and Efficiency!

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STERLING DRILL GRINDER



McDONOUGH MANUFACTURING CO. EAU CLAIRE, WISCONSIN, U. S. A.

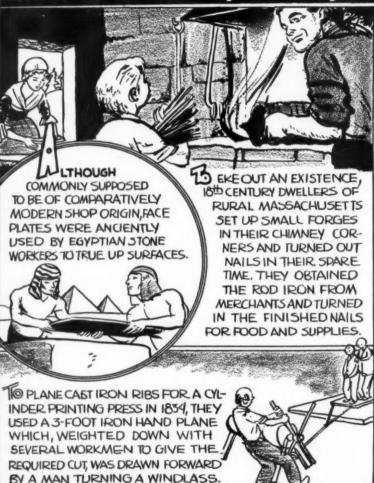
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* Today, you'll enjoy your stay at Hotel Lafayette more than ever! Extensively remodeled and redecorated, this fine hotel offers new convenience and comfort-but the friendly hospitality is the same as ever. Excellent food, home-like rooms, reasonable prices. And remember: Hotel Lafayette is Buffalo's most centrally located hotel. Moderate rates: Single, \$2.75 up; Double, \$4.50 up; special rates for 4 or more.

Write for Folder I.

Mechanics Through the Ages



What is DIE-LESS DUPLICATING? Here is a simple 3-STAGE explanation:

"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines — Shears, Brakes, Benders — especially when used as a continuous, integrated production process.



←1st Stage

Cutting flat material to size and shape for part to be duplicated. The D1-ACRO OShear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. 3 sizes.—shearing widths 6", 9", 12".



LOW PROPERTY.

←2nd Stage

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. 3 sizes, — folding widths, 6". 12". 18".





Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range

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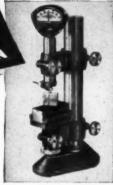


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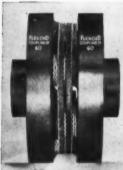
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7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1	4 1/4	2.80
1/2	1/2	1	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1	1	1 3/4	6 1/4	5.40

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3/16	3/8		1/2	2	3/8	1.40
1/4	3/8		5/8	2	1/2	1.40
5/16	3/8		3/4	2	1/2	1.40
3/8	3/8		3/4	2	1/2	1.40
7/16	1/2	1		2	1/16	1.76
1/2	1/2	1	1/4	3	1/4	1.88
5/8	5/8	1	5/8	3	3/4	2.40
3/4	3/4	1	5/8	3	3/4	2.52

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Four Fluted

Dia. of Mill	Dia. of Shank		ength f Flutes		Overall Length	Net Price
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5/16	3/8	1	3/8	3	1/8	1.68
3/8	3/8	1	1/2	3	1/4	1.68
7/16	1/2	1	3/4	3	3/4	2.08
1/2	1/2	2		4		2.16
5/8	5/8	2	1/2	4	5/8	2.76
3/4	3/4	3		5	1/2	3.44

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********	213	3/8	1/8	2 1/8	2.45
204	1	1/2	1/16	2 1/16	1.96
304	2	1/2	3/32	2 3/32	1.96
305	4	5/8	3/32	2 3/32	1.96
404	3	1/2	1/8	2 1/8	1.96
405	5	5/8	1/8	2 1/8	1.96
406	7	3/4	1/8	2 1/8	2.17
505	6	5/8	5/32	2 5/32	1.96
	61	5/8	3/16	2 3/16	1.96
506	8	3/4	5/32	2 5/32	2.17
*******	91	3/4	1/4	2 1/4	2.17
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606	9	3/4	3/16	2 3/16	2.17
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	17	1 1/8	7/32	2 7/32	2.94
809	18	1 1/8	1/4	2 1/4	2.94
	19	1 1/4	3/16	2 2/16	3.22
********	20	1 1/4	7/32	2 7/32	3.22
010	21	1 1/4	1/4	2 1/4	3.22
810 811	22	1 3/8	1/4	2 1/4	3.50
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Index to Advertisers

Abart Gear & Mch. Co166
Aber Engineering Works, Inc347
Abrasive Company
Abrasive Dressing Tool Co
Abrasive Machine Tool Co
Accurate Bushing Company256
Ace Abrasive Laboratories369
Ace Manufacturing Corp252
Acme Diamond Tool Co395
Acme Industrial Co305
Acme Tool Co
Acromark Co
Acro Metal Stamping Co
Advance Tool & Die Co336
Aget-Detroit Mfg. Co
Aircraft Mchy Corp
Aircraft Nut Corp
Alco Tool Co
Almond Co., T. R
Alofs Mfg. Co
American Air Filter Community
American Air Filter Company
American Broach & Machine Co
American Chain & Cable Co185
American Cutter & Engrg. Corp287
American Diamond Tool & Gauge Co366
American Metal Works240
American Photocopy Equipment Co154
American Saw & Mfg. Company107
American Tool Works208
Ames Co., B. C337
Anderson Bros. Mfg. Co344
Anderson & Quigley Co375
Anker-Holth Company253
Annis Co., B. B204
Apeo Mossberg Co309
Apex Machine & Tool Co 18
Archer & Smith, Ltd 83
Armstrong-Blum Mfg. CoInside Front Cover
Armstrong Bray & Co258
Armstrong Bros. Tool Co 4
Aro Equipment Corp 79
Atlantic Saw & Mfg. Co110
Atlas Equipment Co377
Atlas Press Company247-277
Automatic Machine & Tool Co 304
Autometric Corp. 217 Automotive Maintenance Machinery Co
Automotive Maintenance Machinery Co 40
Auto Moulding & Mfg. Co300
Avey Drilling Machine Co212

Baker Bros. Inc32
Baldor Electric Co38
Baumbach Mfg. Co., E. A
Bellows Company 4
Benchmaster Manufacturing Co38
Benchmaster Manufacturing Co
Berkeley Equipment Co10
Beverly Shear Co38
Black Diamond Saw & Machine Works
Blake Co., Edward23
Blaner Co. John 32
Blank & Buxton Machinery Co24
Boggis & Co., Henry P., 22
Roice-Crane Company
Bokum Tool Company 25
Boyar-Schultz Corp242-314-41
Brady-Penrod Company31
Brand Tool & Supply Co
Bremil Mfg Co
Breuer Electric Company20
Bridgeport Safety Emery Wheel Co28
Brown Corp., W. R.
Brown Engineering Co373-39
Brown Engineering Co
Brown & Sharpe Mfg. Co 1
Buffalo Forge Co26
Builders Iron Foundry32
Burke Machine Tool Co38
Burr & Son, J. T26
Busch Co., J. C37

Cadillac Gage Company	29:
Campbell Div., Andrew C. (American Cha	in A
Cable Co.)	18
Canedy-Otto Mfg. Co	218
Capewell Manufacturing Co	13
Carboloy Co., Inc	20
Cardinal Machine Co	248
Carroll & Jamieson Machine Tool Co	35-
Carter Products Co	22
Central Mch. Works	33
Central Tool Co	32
Champion Diamond Company	35
Chandler Tool Company	223
Chicago Die Casting Mfg. Co	381
Chicago Mfg. & Dist. Co	297
Chicago Pneumatic Tool Co	20
Chicago Tool & Engineering Co	370
Chicago Wheel & Mfg. Co19	1.10
Cincinnati Crindom Inc	***
Cincinnati Milling Machines Co.	
Cincinnati Grinders, Inc	155
Circular Tool Co	01
Clark Instrument, Inc	83
Clark, Robert H231	-386
Cleveland Tanning Meh Co	406
Cleveland Tool Engineering Co	. 85
Cleveland Twist Drill Co.	133
Cleveland Twist Drill (Mo-Max Div.)	67
Colborne Mfg. Co	305
Colwell Co., S. G	266
Cone Automatic Machine Co	57
Conway Clutch Co	108
Cooley Electric Mfg. Corp	90
Coulter Machine Co., James	. 62
Covel Manufacturing Co	408
Cratex Mfg. Co	268
Criterion Machine Works362-374	-391
Crobalt, Inc. Crozier Machine Tool Co	.360
Coller Printelle Co	.390
Cullen-Friestedt Co	123
Cullman Wheel CoBack	Cover

Dakon Tool & Machine Co106
Dalzen Tool & Mfg. Co 14
Danly Machine Specialties286
Darnell Corp., Ltd
Dayton Rogers Mfg. Co311
Dearborn, J. W. 377
Defiance Metal Products Co284
Desmond-Stephan Mfg. Co
Dessau Co., Maurice S234-312
Detroit Broach Company 19
Detroit Power Screwdriver Co367
Detroit Stamping Co. 392
Diamond Tool Co. (California)255
Diamond Tool Co. (Chicago)260
Diamond Wheel Industries325
Dix Mfg. Co302
Dolge Co., C. B250
Douglas Machinery Co
Dreis & Krump Mfg. Co 27
Dremel Manufacturing Co115
Drive-All Mfg. Co196
Durant Manufacturing Co349
Duro Metal Products Co269
Dust Lock Air Filter Co44
Dykem Co321
T W-1/ 6 M-1 C- 207
Eastern Machine & Tool Co307 Eastern Precision Gage Co395
East Shore Machine Products Co
Economy Machine Products Co
Eisler Engineering Co
Electrix Corporation
Elgin Tool Works
Elliott Mer Co. 149
Elliott Mfg. Co
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F. & H. Manufacturing Co. 2 Falcon Tool Company. 2 Fanco Machine Co. 2 Fasteut Tool Company. 1 Federal Foundry & Supply Co. 3 Federal Prose Co. 3 Fell Co. Wm. B. 2 Fell Co. Wm. B. 3 Fell Co. Wm. B. 3 Feln Mg. Co. 2 Florian Manufacturing Co. 3 Fonda Gage Sales. 1 Fufflo Specialties Co. 4	686969425966966696666666666666666666666666
Gallmeyer & Livingston Co. General Die-Stamping-Tool Co. General Eng. & Mig. Co. General Eng. & Mig. Co. General Fool & Die Co. General Fool & Die Co. Gibers & Living Mich. Tool Co. Gibers & Living Mich. Tool Co. Gibers & Living Mich. Tool Co. Gishot Machine Co. Gishot Machine Co. Grotton Machine Co. Grant Mig. Company. 248-2 Grant Mig. & Machine Co. Grant Mig. & Machine Co. Greened Arbor Press Co. 3 Greenfield Tap & Die Co. Greenled Tap & Die Co. Grobe File Co. of Am. 111-25 Grobe File Co. of Am. 111-25	03387810830605863

Hall Mfg. Co. 19
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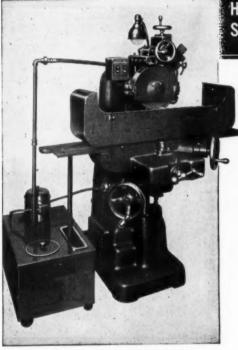
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Walamaroo T & S Co 971	New Plastic Corp. 192 Nichols Eng. Co. (Modern Metor Drives Div.) 383 Nichols-Morris Corp. 92 Nicholson 351 Nicholson & Co. W. H. 351 Nicholson File Co. 177
Kalamazoo T. & S. Co. 271 Kearney & Trecker Corp. 129 Keene Electrical Mchy. 306	Nichols Eng. Co. (Modern Meter Drives Div.) 383
Keene Florizical Mohy 306	Nichols-Morris Corp 92
Kennametal Inc 175	Nicholson & Co. W. H. 351
Kessler Aero Products Co. 94	Nicholson File Co
Kennametal, Inc. 175 Kessler Aero Products Co. 94 King Products 168 Knight Mchry, Co, W. B. 149	Nielsen, Inc
Knight Mchry, Co. W. B	Nielsen Tool & Die Co216
	Nilson Machine Co., A. H313
Kyle-Johnson Mch. Co289	Norgren Co., C. A 50
	Nielsen Inc. 348 Nielsen Tool & Die Co. 216 Nilson Machine Co., A. H. 313 Norgren Co. C. A. 310 Numberall Stamp & Tool Co. 379-389
L. & J. Press Corp	Ohio Units 12
L-W Unick Communication 195	Oliver Instrument Co
Larayette Tool & Supply Co	O'Neil-Irwin Manufacturing Co399
Lagella Tool Co. 221	Onsrud Machine Works, Inc394
Largh Machinery Co. H. 397	
LaRlonda Machine Tool Co R K 901	Paddock Tool Co341
Lee Co. K. O	Parker Co., Chas
Lehmann Machine Co	Parker Co., Chas
Leiman Brothers	Pellow Machine Tool Co357
Lempco Prod., Inc., 102	Plan-O-Mill Corp. 32 Plunkett Machine Co. J. E. 296 Pope Machinery Corp. 51-365 Portage Machine Co. 308
Leslie Welding Co254	Plunkett Machine Co., J. E
Lewis Machine Tool Co	Pope Machinery Corp51-365
Lewthwaite Machine Co., T. H296	Portage Machine Co308
Liberty Tool & Gage Works144-145	
Lima Electric Motor Co	Porter Machine Co266
Lincoln Electric Co210-211	Pratt & Whitney 30
Lealie Weiding Co. 254 Lewis Machine Tool Co. 302 Lewthwaite Machine Co. T. H. 296 Liberty Tool & Gage Works. 144-145 Lima Electric Motor Co. 210-21 Lincoln Electric Co. 210-21 Lincoln Park Industries, Inc. 232 Linderme Machine & Tool Co. 338 388 388	Porter Machine Co
Linderme Machine & Tool Co338	Procunier Safety Chuck Co209
Linley Brothers326	Production Machine Co
Lipe-Rollway CorpInside Back Cover	Producto Machine Co
Linderme Macnine & Tool Co	Products Engineering Co. 258 Putnam Tool Co. 165 Pyrometer Instrument Co. 208
Various Files Counting Co. 122	Promotor Instrument Co. 900
Lovejoy Fiex. Coupling Co	Tyrometer Instrument Co208
Lynn Manufacturing Co237	
Lytti Manufacturing Commission	Quality Tool & Die Co279
	Quality Tool Works
McDonough Manufacturing Co397	Queen City Machine Tool Co 75
Machine Products Corp 38	R & L Tools221
Machinery Mfg. Co 96	R & L Tools
McGill Manufacturing Co. 3712	Racine Tool & Machine Co. 37
Madison-Kipp Corp178	Remco Products Corp233
Mall Tool Company259	Reynolds Mchy. Co355-379
Marshall Tool & Supply Co380	Richards Co., J. A204
Marshalltown Mig. Co 98	Rickert-Shaler Co 97
Masonite Corp. 265 Master Electric Company 317	Rivett Lathe & Grinder, Inc
Master Electric Company	Bookford Deilling Marking Co. 100
Master Tool Co. 202	Rogers Machine Works
Master Gauge Co. 307 Master Tool Co. 393 Mead Specialties Co. 310-346	Ross Co David I 100
Molin Mills 33	Rotary File Co. 93
Melin Mills	Rotor Tool Co. 49
Merz Engineering Co	Rouse & Co., H. B
Meyers Company, W. F	Rusnok Tool Works
Michigan Chrome & Chemical Co318	Ruthman Machinery Co
Michigan Drill Head Co355-389	Ryerson & Son, Inc., Jos. T., 126
Michigan Tool Company163	
Melin Mills	S & S Machine Works 355
Mid States Equipment Co353	Sav-Way Industries
Midwest Abrasive Co. 245 Mid-West Hydro Pierce Inc. 2 245 Mid-West Hydro Pierce Inc. 2 387 Midwest Tool & Eng. Co. 387 Miller-Knuth Mfg. Company 311 Minn-Kota Manufacturing Co. 156 156 Minn-Kota Manufacturing Co. 156 156 Minn-Kota Manufacturing Co. 156 Minn-Kota Minn-Kota Manufacturing Co. 156 Minn-Kota Man	Sav-Way Industries 47 Schauer Machine Co. 186
Mid-West Hydro Pierce Inc	Scherr Co., George251
Midwest Tool & Eng. Co	Schmidt Inc., Geo. T283
Mine Fete Manufacturing Co. 156	Schrillo Co364
Modern Machine Co. 968	Schrillo Co. 364 Schultz & Anderson Co. 264-299 Scientific Lubricants Co. 292
Modern Machine Tool Co. 52	Scientific Lubricants Co292
Modern Machine Co	Scully-Jones & Co191
Modern Motor Drives Div. (Nichols Eng. Co.) 383	Seneca Falls Machine Co
Modern Tools 353	Severance Tool Industries, Inc
Modern Tools	Shelden Machine Co
Molina Ind. Diamond Co. of U. S	Siewek Tool Die Demestia Industries 275
Monarch Machine Tool Co138-139	Signurney Tool Co. 250
MICHIEL CARCINI ACRIA COLLEGE	Skilsaw Inc 199
	Smallpeice Ltd. 256
Motor Tool Mfg. Co407	Sculiy-Jones & Co. 191
Motor Tool Mig. Co	8mith, & Co. D. A. 333 8mith Power Transmission Co. 400 8mith Tool & Eng. Co. 317
Murphy & Co., James A387	Smith Power Transmission Co400
Murray Mig. Co., D. J246	Smith Tool & Eng. Co317
	Sommer & Adams Co
National Acme Co	Sossner Tool & Machine Works243
New Britain Tool & Mfg. Co	South Bend Lathe Works124
New England Carbide Tool Co87	Southwest Manufacturing Co319
New Method Steel Stamps, Inc343	Specialties Manufacturing Co120



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Square Surface Plate & Tool Co31
Stackbin Corporation
Standard Electrical Tool Co 7
Standard Dropped Steel Co.
Standard Pressed Steel Co
Standard Transmission Equip. Co20
Star Cutter Company11
Stark Tool Co28
Steege Machinery Co., W. L32
Stokerunit Corp
Stuart Engineering Div. 24
Sturdinatic Tool Co. 11:
Sturtevant Co., P. A
Sundstrand Machine Tool Co. 2.
Sunnen Products Co10
Sun Oil Co
Swedish Gage Co, of America406
Syncro Devices
Syntron Company
syntron Company21
T. & H. Mfg. Co204-266
Tamms Silica Co
Tannewitz Works
Tannewith Works
Tatra Tool Company397
Tavella Sales Co29
Taylor Machine Co395
Templeton-Kenly & Co393
Thomas Hoist Company200
Threadwell Tap & Die Co135
Trico Fuse Mfg. Company298
Trindl Products, Ltd391
Triplex Machine Tool Corp355
Troyke, Alfred A
Tungsten Alloy Mfg. Company301
Tungsten Electric Corp167
Turchan Follower Machine Co 54
Turner Uni-Drive Co 43
U. S. Hoffman Machinery Corp207
II S Tool Company 26
U. S. Tool Company
Unique Manufacturing Co387
Cilique atanuracturing Co

United Aircraft Parts Mfg. Co.	7: 4:5 6:4
Yacuum Can Company. 1 Yan Kcuren Co. 11 Yard, Inc. 2 Veit Manufacturing Co. 32 Victor Machinery Exchange. 401-402-403-4 Vimeo Mfg. Co. 1 Vonnegut Moulder Corp. 33	53 29 29 95 40 35
Wade Instrument Co 2° Wade Tool Co 5 Walker-Turner Co 2°	28
Wallace Supplies Mfg. Co	16 19 10
Weber Machine Corp. 35 Welch Industries 9 Weldex Inc. 29	19
Wells Manufacturing Corp. 5 Wesson Company 8 Western Tool & Mfg. Co. 36	5
Wetmore Reamer Co. 17 Wheel Trueing Tool Co. 28 White Dental Mfg. Co. S. 18 Whitney Metal Tool Co. 27	5
Willey's Carbide Tool Co	9
Winter Brothers Co. 20 Wittek Mfg. Co. 29 Woodworth Co. N. A. 13	5
Wyzenbeek & Staff 10 Yeomans Tool Co. 34 Yost Mfg. Co. 37	7
Zagar Tool, Inc	8

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